

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

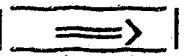
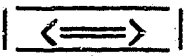
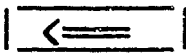


A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard				SIS		
B01 = Trouble-shooting chart	A	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	B	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	C	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	D	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	E	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	F	XXXXX	XXXXX	XXXXX	XXX	
	G	XXXXX	XXXXX	XXXX		
	H					
	J					
	K					
	L					
	M					
N01 = Service information	N	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index
N28 = Table of contents and publication information						

- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section
A01			

HOW TO USE THIS MICROCARD

Trouble-shooting instructions for system:
L3.2 - Jetronic
Description, photographs, terminal designations and special features refer to vehicle:


ALFA 33 1.7 i.e.
with 1.7 l / 4-cylinder engine 10.87 ->

These basic instructions represent detailed trouble-shooting instructions. They are not to be used as vehicle-specific instructions.

Caution!
Descriptions and photographs may deviate from the vehicle-specific brief instructions.

Binding set values, terminal assignments and special features are only to be taken from the vehicle-specific brief instructions.

For brief instructions, please refer to Microcard Overview KFZ-0...

A02		
-----	--	---

SPECIAL FEATURES

- * L3.2 - Jetronic
- * 15-pole control unit
- * Control unit attached directly to air-flow sensor.
- * Air-flow sensor is connected to control unit via an internal 4-pole plug connection.
- * Air-flow sensor with no bypass channel and CO adjusting screw.
- * CO adjusting screw on control unit.
- * Pump relay instead of control relay.
The pump relay is actuated by the control unit.
- * Plausibility, i.e. a substitute value, e.g. +80°C, is provided by the control unit in the event of defective sensors or leads, such as engine temperature. This applies to the following sensors:
temperature sensor (engine),
temperature sensor (intake air),
throttle-valve switch (idle),
throttle-valve switch (full load).
- * The air-flow-sensor signal is brought out for further applications at the control-unit plug.
- * Start control, i.e. additional quantity of fuel injected by way of all injection valves.
- * Lambda closed-loop control with heated sensor and t v coding, (t v = response-delay time).

SPECIAL FEATURES (CONTINUED)

- * Triggering of injection at control unit term. 1 by way of ignition pulses from term. 1 or by way of TD square-wave signals from ignition trigger box.
- * Altitude correction at term. 7 by way of pressure sensor. Vehicles with no pressure sensor feature a jumper between term. 2 and term. 7 so that the lambda system provides closed-loop control.
- * Multiple assignment term. 6
 - Basic function = t v coding for lambda closed-loop control.
 - At least 2s to ground = Diagnosis stimulation.
- * Multiple assignment term. 10
 - Basic function = Sensor monitoring.
 - Idle and full-load contact closed = Test output for lambda closed-loop control.
 - Following stimulation at term. 6 = Diagnosis output.
- * Tank ventilation system with active-carbon container. Ventilation controlled as a function of load by way of throttle-valve position.
- * For supplementary system information, see Service Information "New System L3-Jetronic" on Microcard PKW-038 Coordinate N 05.

SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

For testing of compressions pressure, disconnect pump relay in order to prevent undesired injecting of the injection valves.

Do not short-circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and possibly control unit will be destroyed.

Never connect positive pole of battery to ignition coil term. 1. Control unit will be destroyed.

If installing an alarm system, follow installation instructions for L-Jetronic vehicles or SIS microcard PKW 012. Make sure that the alarm relay is not disturbed by external fields (e.g. from ignition leads), thus incorrectly triggering.

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Never start engine without battery securely connected (battery terminals tightened). Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.

Provide starting assistance only with second 12 V battery and jump leads.

Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

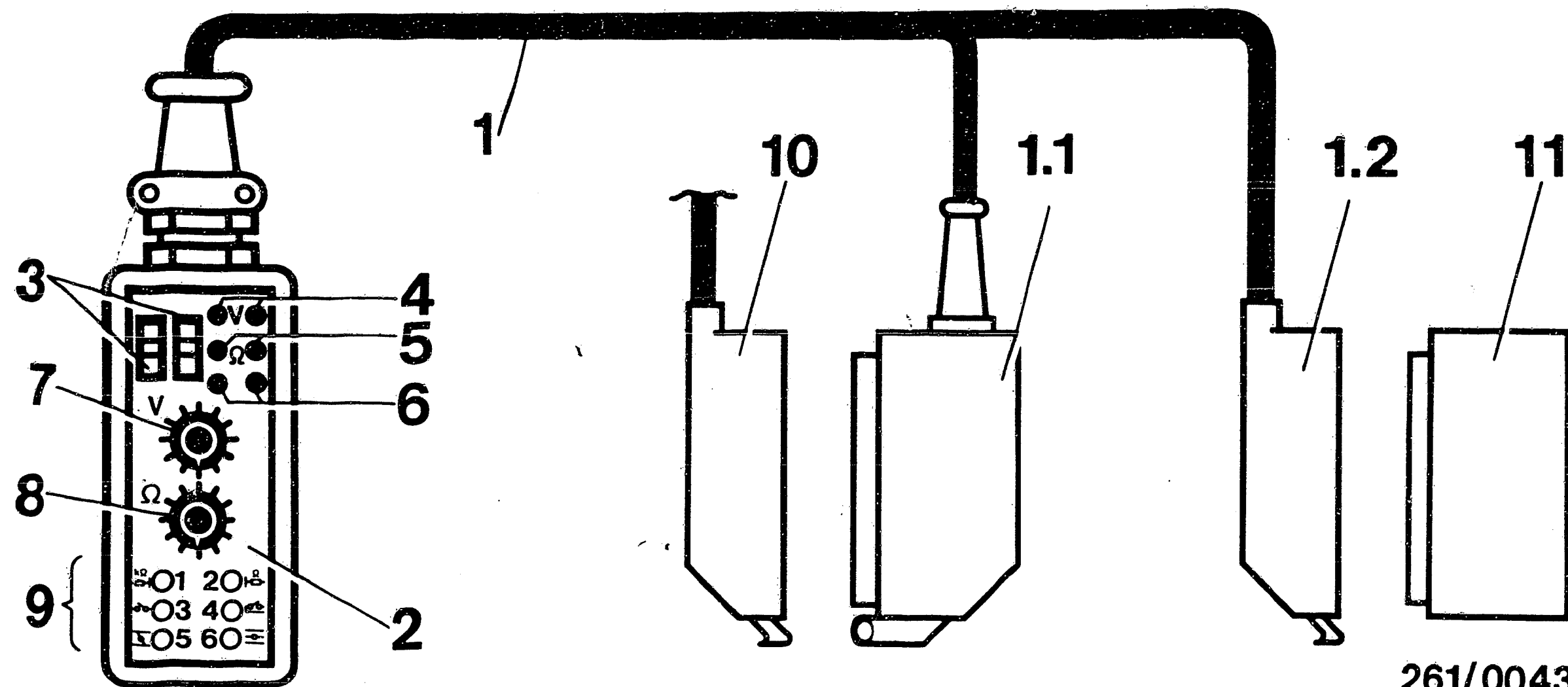
Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

TESTERS AND TOOLS

Name	Designation	Part No.
Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 168
Motortester e.g.	MOT 201	0 684 000 201
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Test lead		1 684 463 093
Test leads for proper connection		KDZS 0004 KDUM 0008
Digital multimeter e.g.	MMD 301 Fluke Co.	0 684 500 301 75 or 77
CO analyzer e.g.	ETT 008.14 ETT 008.15	0 684 100 814 0 684 100 815
Pressure measuring device or pressure gauge		KDJE-P 100
	Meas. range 6 bar Scale div. 0.1 bar Quality class 1.0	
Three-way line Connection part	KDJE-P 100/14 or	KDJE-P 100/13 KDJE-P 100/16
Set of parts for sol.-op. injection valve, pressure regulator		1 287 010 704
Mounting paste for lambda sensor	VS 14016 Ft 120g 450g	5 964 080 112 5 964 080 145
Vacuum hand pump	Mityvac Pump L.-Kloos-Str.21	Korinth Co. 6450 Hanau 7
Sleeve-type supp. 5k Ω		0 356 500 001
Temperature sensor		0 280 130 028
1 battery 1.5 V (unicell) for simulation of lambda-sensor voltage.		Commercially available
Pressing-on tool for CO intervention safeguard		Commercially available

For production reasons:
continued on the following
coordinate.

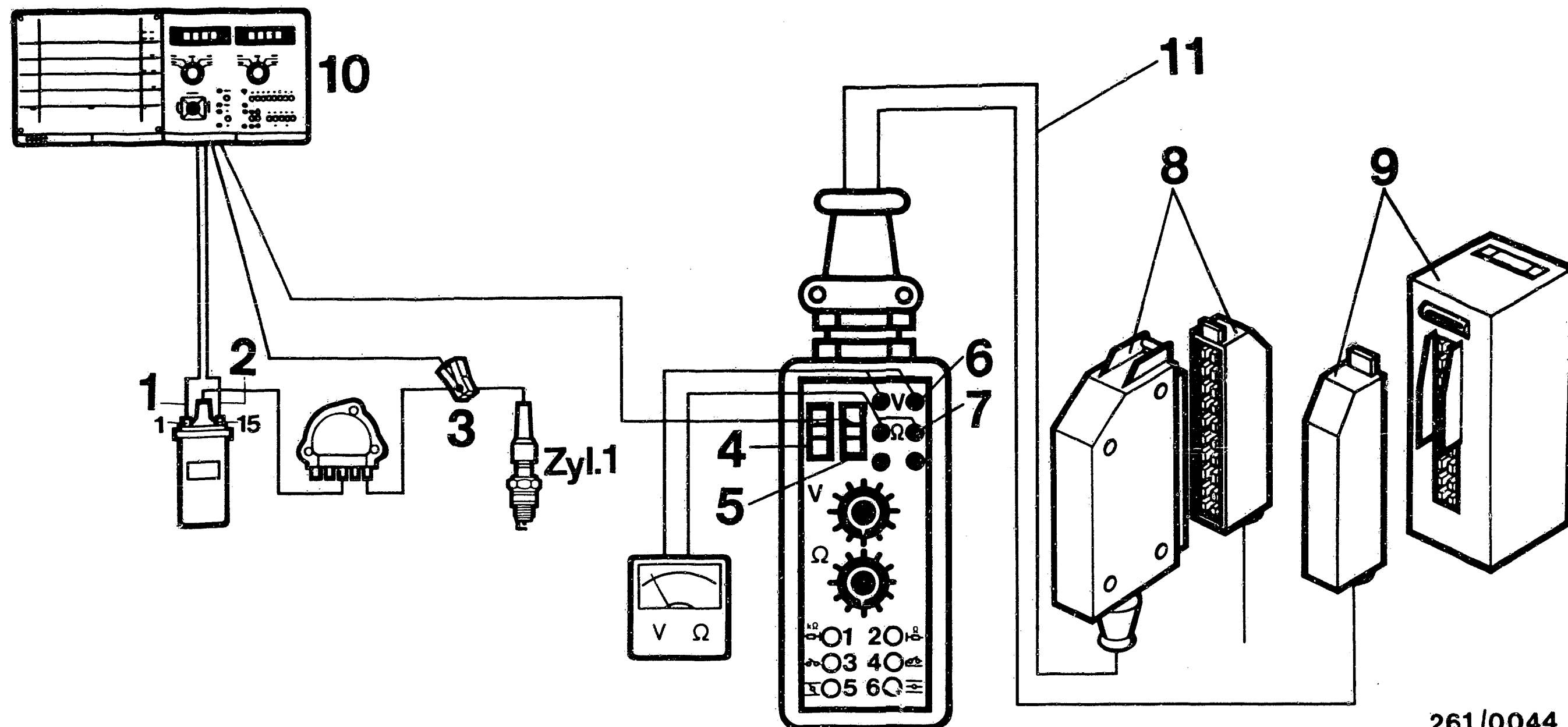


261/0043

Universal test adapter with adapter lead

- 1 = Adapter lead (1 684 463 168)
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2 = Universal test adapter
(0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (voltage measurement)
- 5 = Test sockets (resistance measurement)
- 6 = Not used
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of
operating conditions
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm (+80°C)
- Button 3 = Pump energization
- Button 4 = Not used
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load con.
- 10 = Wiring harness
- 11 = Control unit

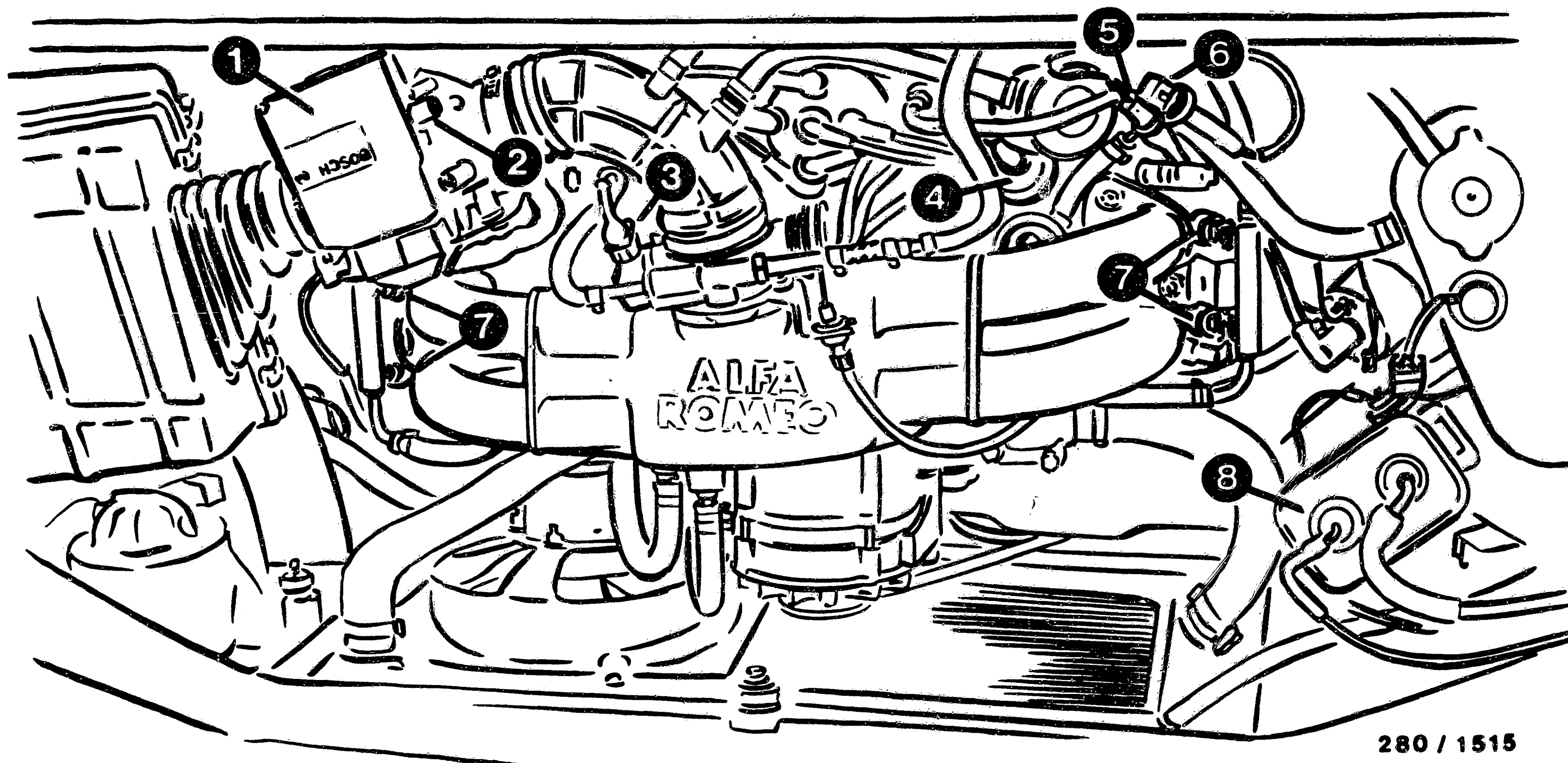


261/0044

- 1 = Green clip to ignition coil term. 1
- 2 = Yellow clip to ignition coil term. 15
- 3 = Induction-type clamp-on pickup over ignition cable of cylinder 1
- 4 = Red connection socket test well for red clamp of motortester
- 5 = Black connection socket (test well) for black clamp of motortester

- 6 = Connection of voltmeter at V sockets (red = +, black = ground/ -)
- 7 = Connection of ohmmeter at Ω sockets (blue)
- 8 = Connection to wiring harness
- 9 = Connection to control unit
- 10 = Motortester
- 11 = Adapter lead (1 684 463 168)

TERMINAL DIAGRAM FOR UNIVERSAL TEST ADAPTER



280 / 1515

1 = Measuring and control unit consisting
of air-flow meter and control unit
2 = CO adjustment potentiometer
(lambda closed-loop control)

3 = Throttle-valve switch
4 = Pressure regulator
5 = Plug, lambda sensor

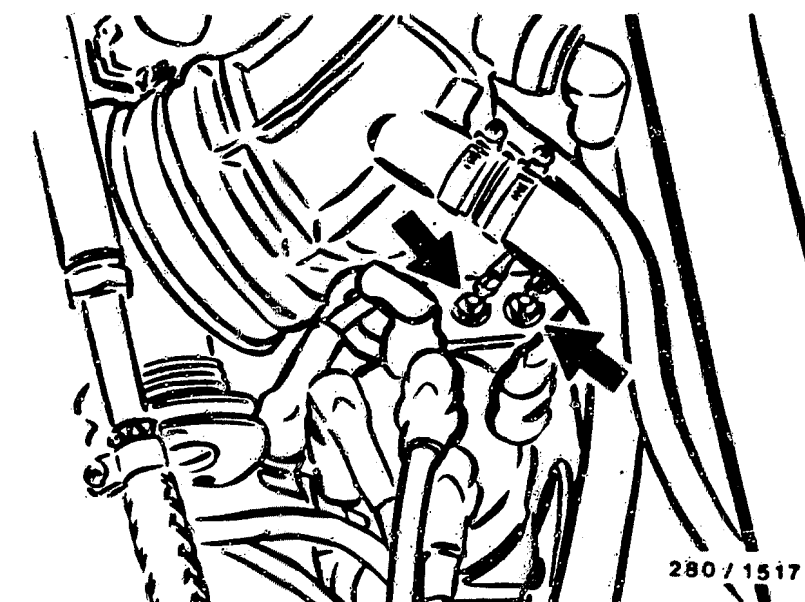
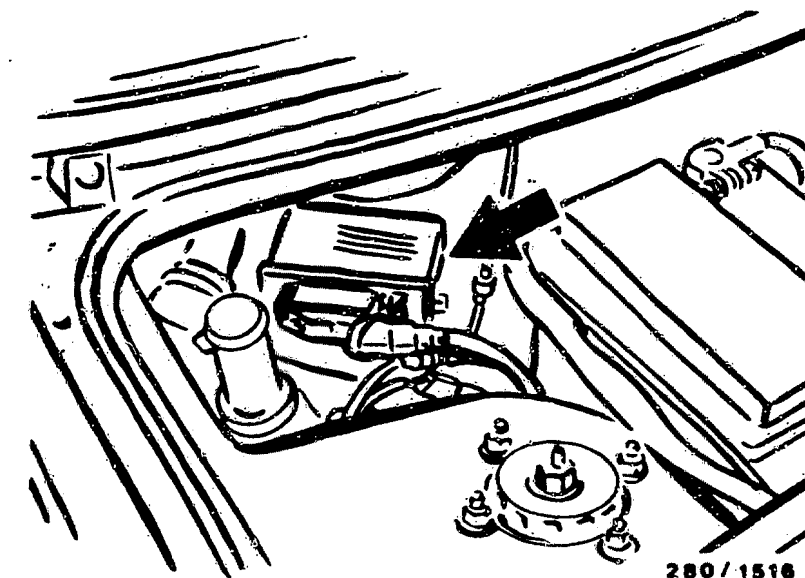
6 = Plug, sensor heater
7 = Solenoid-operated injection valves
8 = Activated carbon canister

INSTALLATION POSITION OF COMPONENTS

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The directions "left" and "right" are always with reference to the forward direction of travel.

- * Upper illustration
Arrow = Ignition control unit
- * Center illustration
Arrow = Central ground
- * Lower illustration
Arrow = Temperature sensor (engine)
On the right-hand side between the intake-manifold passages.



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Upper illustration
 Arrow = Electric fuel pump
 At the vehicle floor behind the left-hand McPherson strut.

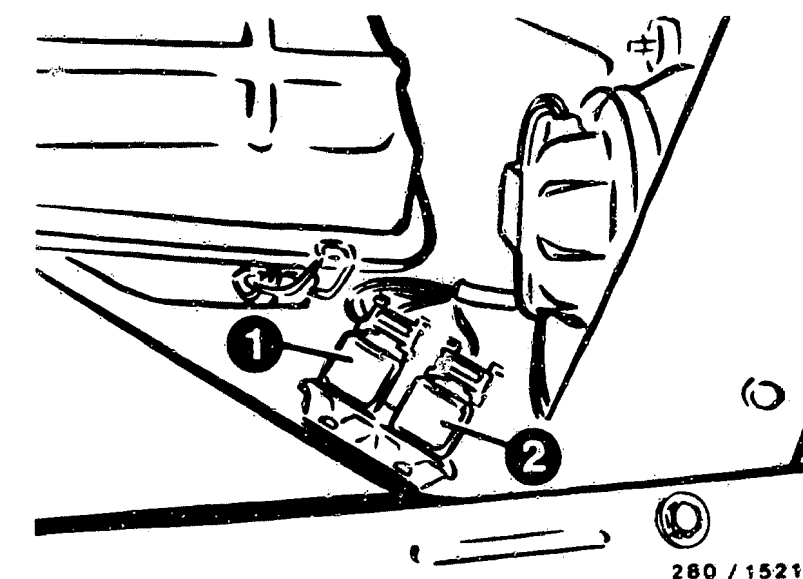
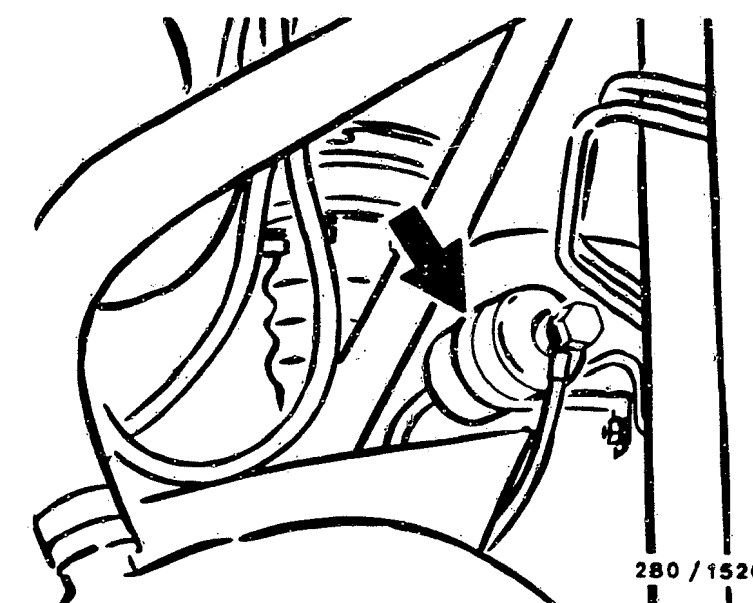
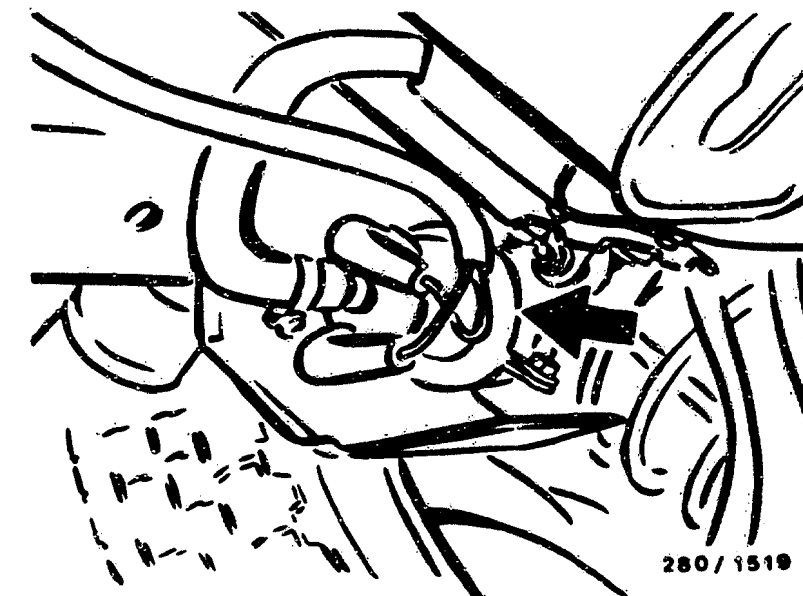
* Center illustration
 Arrow = Fuel filter

* Lower illustration
 1 = Main relay
 2 = Pump relay
 Both relays are located beneath a protective cover.

* Heated lambda sensor:
 In the exhaust pipe before the catalytic converter.

* Auxiliary-air device:
 On the right-hand side behind the intake-manifold passages.

* Tank-ventilation valve (driven by vacuum):
 Beneath the activated carbon canister.



Separate measuring and control unit

Removal and mounting of the control unit from the air-flow sensor is necessary only for the following operations:

- * Electrical test of air-flow sensor (potentiometer and temperature sensor (intake-air)).
- * Replacement of air-flow sensor
- * Replacement of control unit

Removal of control unit:

Unlatch 15-pin plug and remove.

Remove measuring and control unit from air-filter housing and loosen air-guide hose.

When removed, clean measuring and control unit, particularly area of plug, joint and screw-on points.

Use a clean cloth and benzine, if necessary.

Dry only with hot air! Compressed air is not allowable.

Avoid excessive jolting when handling.

Lever out anti-tamper cap of connecting screw.

Unscrew 4 connecting screws.

Remove control unit vertically upward, without tools.

Caution: do not tilt, do not damage sealing edges.

Do not soil interior of control unit or air-flow sensor, and be sure to avoid pressure on protective cover.

Mounting of control unit:

Replace defective component, air-flow sensor or control unit.

Clean sealing groove on control unit and press in new steel ring, correctly positioned. Do not turn seal ring.

Clean seating surface on air-flow sensor.

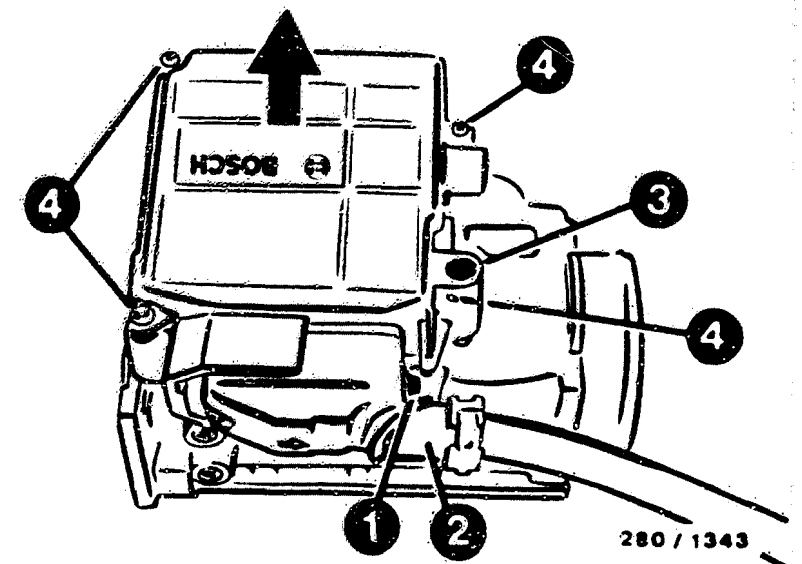
Place control unit on air-flow sensor and press in parallel.

Wet threads of 4 connecting screws with locking paint and screw in. Tighten cross-wise to 1.0...1.4 Nm torque. Press anti-tamper cap No. 1 280 508 004 onto connecting screw.

Screw measuring and control unit onto air-filter housing and mount air-guide hose.

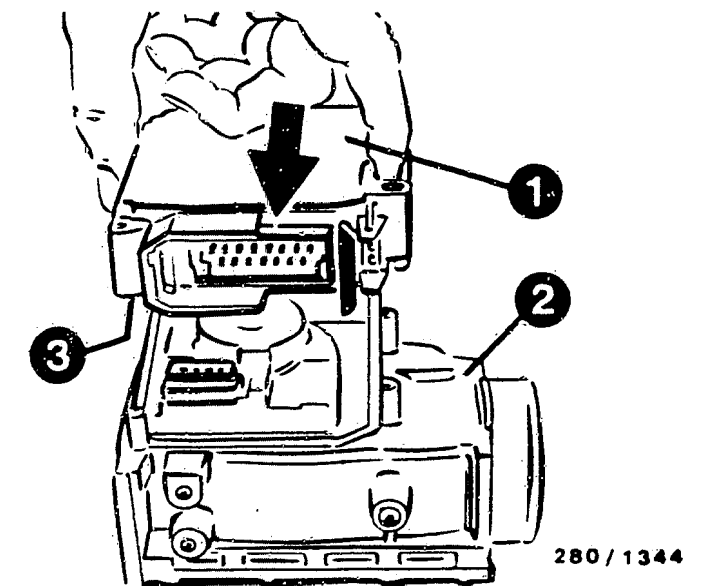
Connect 15-pin plug and latch in.

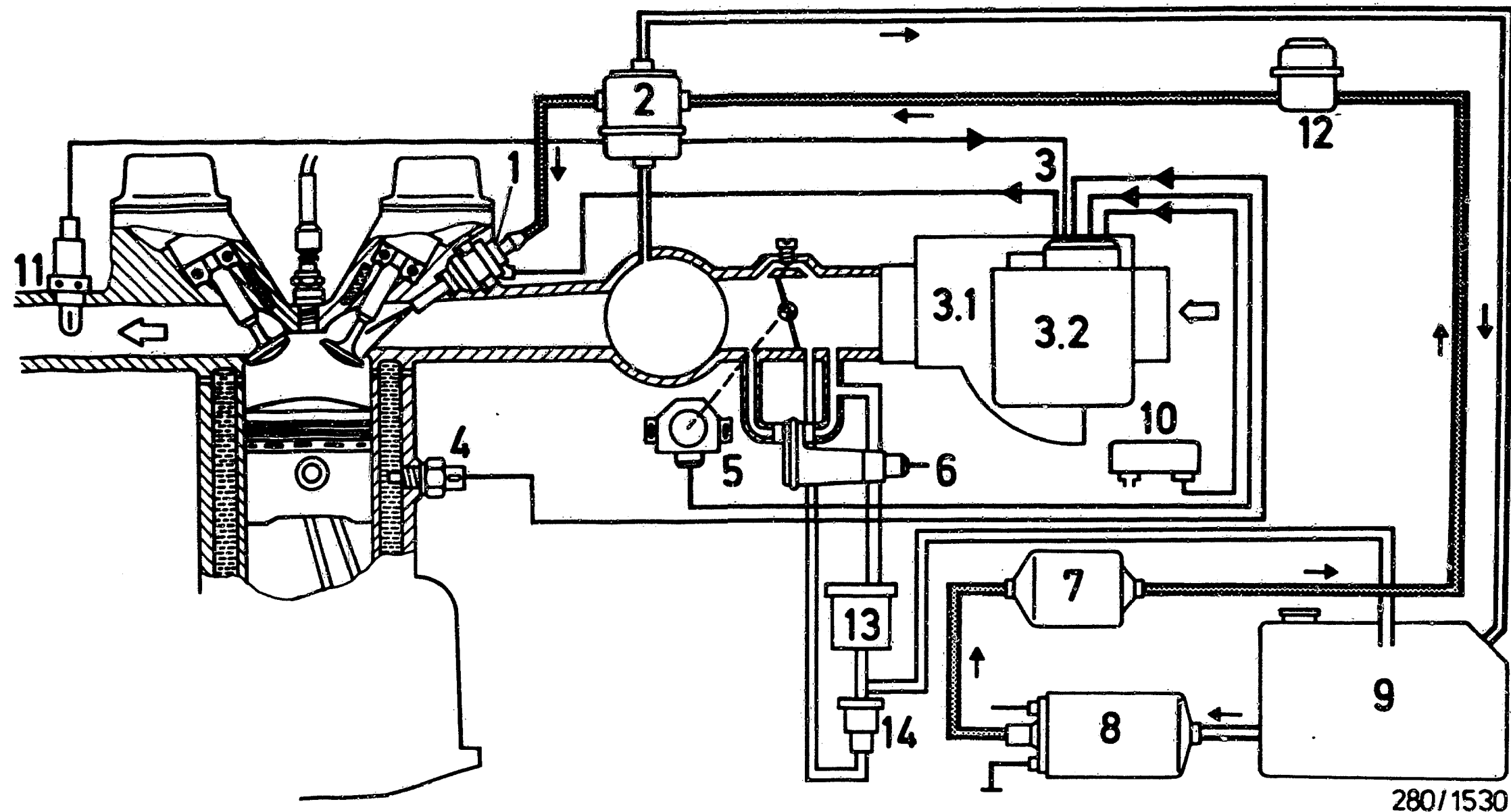
After installing a new air-flow sensor or control unit, perform idle adjustment. See Coordinate D25.



- 1=Latching spring
- 2=15-pin plug
- 3=Anti-tamper cap
- 4=Connecting screws
- Arrow =Pull off control unit vertically

- 1=Control unit
- 2=Air-flow sensor
- 3=Seal ring
- Arrow =Press on control unit vertically, parallel





- 1 = Solenoid-operated injection valve
- 2 = Pressure regulator
- 3 = Measurement and control facility
- 3.1 = Air-flow sensor
- 3.2 = Control unit
- 4 = Temperature sensor, engine

- 5 = Throttle-valve switch
- 6 = Auxiliary-air device
- 7 = Fuel filter
- 8 = Electric fuel pump
- 9 = Fuel tank
- 10 = Pressure sensor (altitude sensor)

- 11 = Lambda sensor
- 12 = Fuel-pressure damper
- Tank ventilation system
- 13 = Active-carbon container
- 14 = Tank ventilation valve

===== Fuel pressure

===== Pressureless

When performing trouble-shooting, consideration is to be given to the fact that additional systems/components such as brake booster, centralized locking system or vacuum headlight vertical-aim control may be connected to the intake manifold and may thus represent additional sources of error.

DIAGRAM OF AIR AND FUEL LINES

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts on coordinate B03 and contains customer complaints (fault symptoms) with several possible causes (component faults) in each case as well as coordinate references for detailed trouble-shooting. If no coordinate reference is given, this is a cause for which no test instructions are required.

Components that are checked by the self-diagnosis or with the universal test adapter are not listed in the trouble-shooting chart.

If the customer complaint is clear, proceed with trouble-shooting in the given order of possible causes one after the other and step by step.

Always start trouble-shooting with the self-diagnosis (if applicable) or with the universal test adapter (if provided). Only then continue with the trouble-shooting chart.

If the customer complaint is not clear, check all the causes listed in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (owing to the interlinking of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (continued)

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. It is divided into three rows of boxes.

The left-hand column contains test instructions and set values.
The center column contains instructions on trouble-shooting and fault rectification.
The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.
After rectifying a fault repeat the test as a check.

REQUIREMENTS FOR TESTING:

- Battery fully charged
- Engine in good mechanical condition (e.g. compression, valve clearance etc.)
- Engine at operating temperature, approx. +80°C (where necessary)
- Proper seating of all plug connections of wiring harness
- Ignition system O.K.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)										Coord.
*	*	*	*	*	*	*	*	*	*	A09
*	*	*	*	*	*	*	*	*	*	C19
*	*	*	*	*	*	*	*	*	*	C21
*	*	*	*	*	*	*	*	*	*	C23
*	*	*	*	*	*	*	*	*	*	D01
*	*	*	*	*	*	*	*	*	*	D03
*	*	*	*	*	*	*	*	*	*	D11
*	*	*	*	*	*	*	*	*	*	D13
*	*	*	*	*	*	*	*	*	*	D15
*	*	*	*	*	*	*	*	*	*	D19
*	*	*	*	*	*	*	*	*	*	D21
*	*	*	*	*	*	*	*	*	*	D25
*	*	*	*	*	*	*	*	*	*	D27
*	*	*	*	*	*	*	*	*	*	E03
*	*	*	*	*	*	*	*	*	*	E05

HOW TO USE THE TEST CHART FOR THE UNIVERSAL TEST ADAPTER

- Before testing, check all multiple plug-in connections for loose contacts.
- Clean plug-in contacts if dirty or corroded.
- Check for blade receptacles that have been pushed back. If necessary, bend back locking lug and press receptacle as far as it will go into plug housing; locking lug latches.
- Suspicion of line breaks (positive and negative leads) in case of kinking and pinching.

Connect adapter lead.

The tests cover the peripherals and, where applicable, also the control unit.

To take readings, connect to the universal test adapter a multimeter for voltage and resistance measurements and/or a motortester.

The test must always be performed completely, starting at test step 1, in the order given.

TEST PROCEDURE:

- The individual test steps build on one another.
Example: If, in one test step, the ground connection for the control unit is tested, this test is not repeated again in the further test steps.
- If, in one test step, the set value is not obtained, this test step must be repeated after the fault has been rectified.

Note:

In the following test steps, the passages with an additional frame around them show which operation has to be changed compared with the preceeding test step.

Component/function:

Only connect control-unit plug.

Engine temperature sensor, leads/resistance.

N>

* Operation:

Prog. switch "V"

Prog. switch " Ω "

Test button

Position

⇒

5

—

* Measuring equipment

Motortester or multimeter

* Measuring range:

approx. 5k Ω or 500 Ω

* Connection:

Test sockets, ohms, blue

* Trigger function on vehicle:

Not applicable

* Set value:

At ambient temperature

+15°...+30°C:

1.45...3.3 k Ω

With engine at operating temp.

approx. +80° C:

280...360 Ω

Is measured value within set-value tolerance?

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter.

Measure resistance directly at temperature sensor (engine).

Ambient temperature

+15°...30°C

Set value: 1.45...3.3 k Ω

with engine at operating temp.

approx. +80°C

Set value: 280...360 Ω

If set set values are not obtained => replace temperature sensor.

Check the following leads for continuity with ohmmeter, set value approx. 0 Ω :

* From control-unit plug term. 8 to temperature sensor (engine)

* From control-unit plut term. 5 to temperature sensor (engine)

Eliminate open circuits/contact resistances.

Diagram showing the top view of a control-unit plug. It features a rectangular connector with multiple pins. Four specific terminals are labeled: KI. 1 (top left), KI. 8 (top right), KI. 9 (bottom left), and KI. 15 (bottom right). The plug is shown with a locking tab on the right side.

227 / 354

Top view of control-unit plug

Top view of connector of engine-temperature sensor

Diagram showing the top view of the engine-temperature sensor connector. It has a hexagonal outer housing. Inside, there are two rectangular terminals on the left and right, and a smaller, T-shaped terminal at the bottom. The entire assembly is mounted on a circular base.

280 / 1346

Continued on next picture page

B05

⇒

B06

⇐⇒

Component/function:

Ground connection of output stage.

N>

* Operation:	Position
Progr. switch "V"	==>
Progr. switch "Ω"	6
Test button	—

* Measuring equipment
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Blue test sockets, ohm

* Operation in vehicle:
Not applicable

* Set value:
0...10 Ω

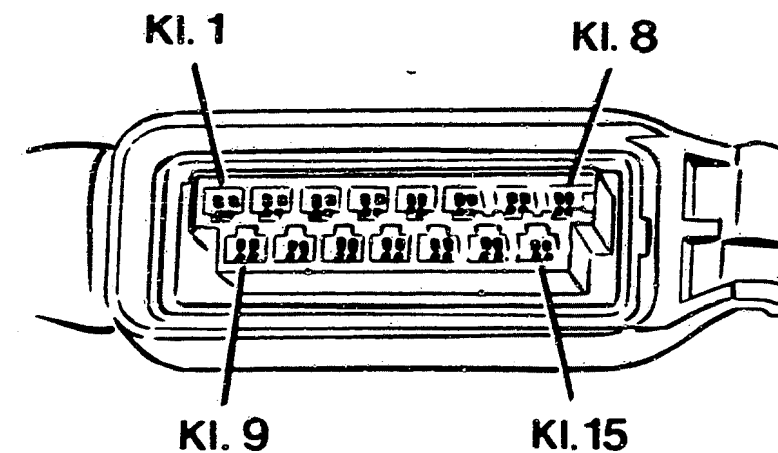
Is measured value within
set-value tolerance?

Trouble-shooting:

For testing, disconnect control-unit plug.

Check the following leads
for continuity with ohmmeter,
set value approx. 0 Ω :

- * From control-unit plug
term. 4 to vehicle ground.
- * From control-unit plug
term. 5 to vehicle ground.
Eliminate open circuits/
contact resistances.



227 / 354

Top view of control-unit plug

Continued on next picture page

Component/function:

Connection of t v coding of
lambda closed-loop control.

* Operation:	Position
Prog. switch "V"	=>
Prog. switch "Ω"	7
Test button	—

N>

* Measuring equipment
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Test sockets, ohms, blue

* Trigger function on vehicle:
End of lead from term. 6
to ground.

* Set value:
0...10 Ω

Is measured value within
set-value tolerance?

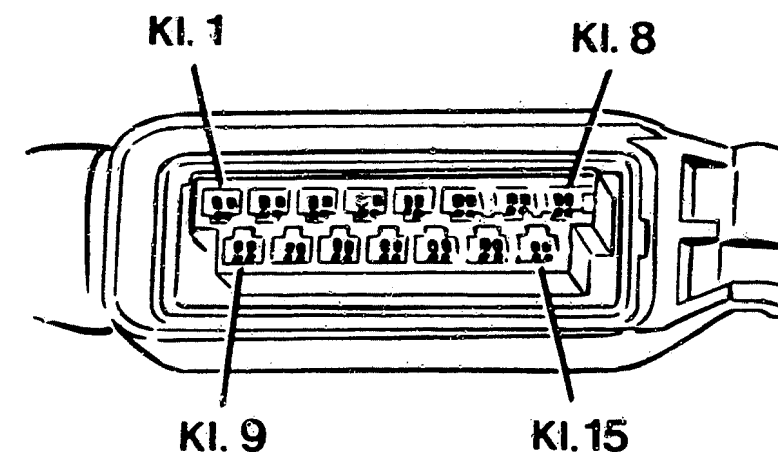
Trouble-shooting:

For testing, disconnect
control-unit plug.

Check the following lead
for continuity with ohmmeter,
set value approx. 0 Ω :

From control-unit plug
term. 6 to end of lead.

Eliminate open circuits/
contact resistances.



227 / 354

Top view of control-unit plug

Continued on next picture page

Component/function:

Throttle-valve switch, leads/
resistance of idle contact,
adjustment.

* Operation:	Position
Prog. switch "V"	==>
Prog. switch "Ω"	9
Test button	—

N>

* Measuring equipment
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Test sockets, ohms, blue

* Trigger function on vehicle:
Accelerator pedal not depressed

* Set value:
0...10 Ω

* Trigger function on vehicle:
Depress acc. pedal somewhat

* Set value:
infinity Ω

Is measured value within
set-value tolerance?

Y

V

Continued on next picture page

Trouble-shooting:

Requirement: throttle valve is
correctly adjusted.

It must come up against the
adjusting screw with the lever
just before it sticks.

Secure against turning.

- * Adjust throttle cable/linkage
so that it is free of tension.
- * If kinked => replace.

For testing, disconnect
control-unit plug from test
adapter.

Adjustment of throttle-valve
switch

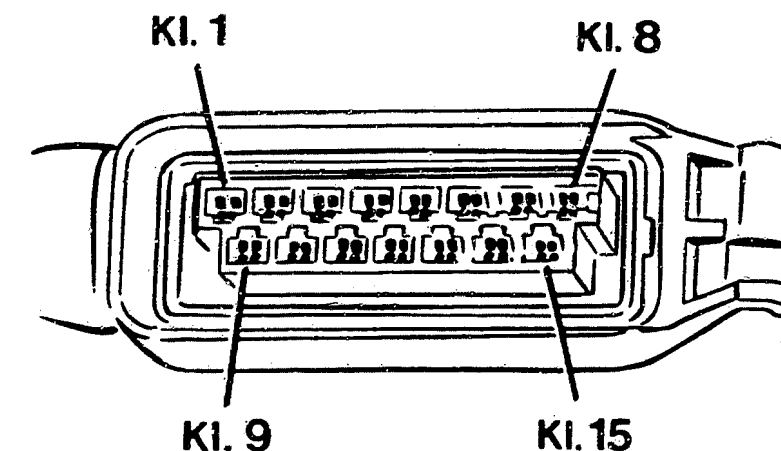
Loosen fastening screws
slightly. Connect ohmmeter
to throttle-valve switch
between term. 2 and term. 18.

Turn throttle-valve switch
until the idle contact closes
(microswitch clicks audibly).
Reading 0 Ω. If not =>
replace throttle-valve switch.

Checking the adjustment:
Pull slightly on throttle
cable. The idle contact opens
(microswitch clicks audibly).
Reading: infinity Ω.

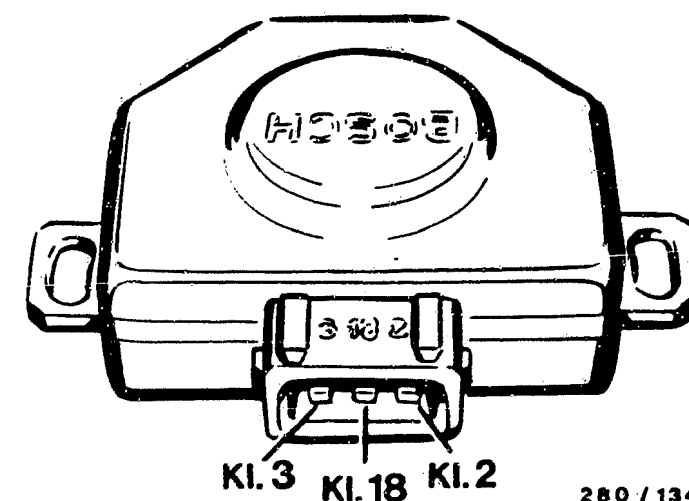
Check the following leads for
continuity with ohmmeter,
set value approx 0 Ω :

- * From throttle-valve switch
term. 2 to control-unit
plug term. 15
- * From throttle-valve switch
term. 18 to vehicle ground.
Eliminate open circuits/
contact resistances.



227 / 354

Top view of control-unit plug



280 / 1347

Component/function:

Throttle-valve switch, leads/
resistance of full-load
contact.

* Operation:	Position
Prog. switch "V"	⇒
Prog. switch "Ω"	■
Test button	—

* Measuring equipment
Motortester or multimeter

* Measuring range:
x 10 Ω

* Connection:
Test sockets, ohms, blue

* Trigger function on vehicle:
Accelerator pedal not depressed

* Set value (indication):
infinity Ω

* Trigger function on vehicle:
Completely depress acc. pedal

* Set value (indication):
0 - 10 Ω

Is measured value within
set-value tolerance?

N>

Trouble-shooting:

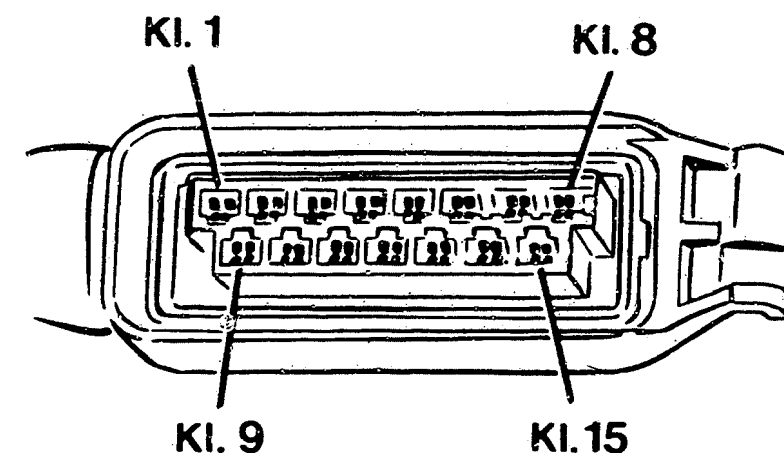
For test purposes, detach
control-unit plug from
test adapter.

Measure resistance directly
at throttle-valve switch
at term. 3 and term. 18.
Accelerator pedal not depressed
Set value: infinity Ω
Fully depress accelerator pedal.
Set value: approx. 0 Ω
If set values are not
attained => renew throttle-
valve switch.

Use ohmmeter to test following
leads for continuity,
Set value approx 0 Ω :

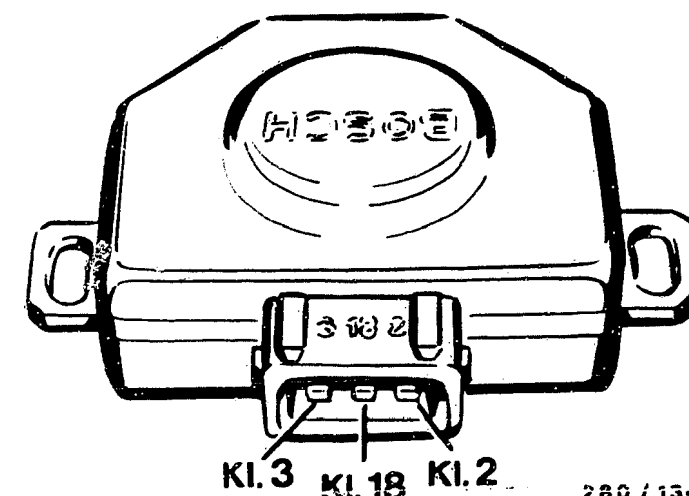
* From control-unit plug
term. 14 to throttle-valve
switch term. 3.

Eliminate open-circuit/
contact resistance.



227 / 354

Top view of control-unit plug



280 / 1347

Continued on next picture page

Component/function:

Ignition system, leads/
term. 1 or TD engine-speed
signals at L3 control unit.

* Operation:	Position
Prog. switch "V"	⇒
Prog. switch "Ω"	5
Test button	—

N>

* Measuring equipment:

Ignition oscilloscope

* Measuring range:

Special input
Control lever, left stop
Measuring range 20V

* Connection:

Test recesses

* Trigger function on veh.:

Ignition "ON" and start

* Set values (indication):

Ignition pulses or rectangular
pulses, voltage magnitude
at least 80% of battery
voltage.

Pulses present?

Trouble-shooting:

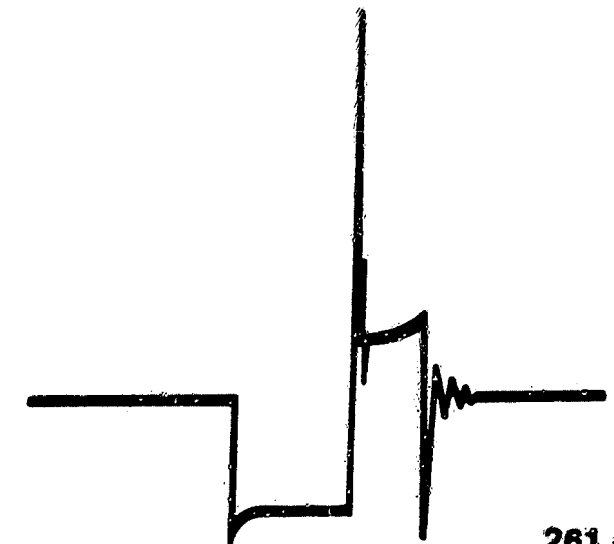
For testing, disconnect
control-unit plug from test
adapter.

Check the following leads
for continuity with ohmmeter,
Set value approx. 0 Ω :

- * From control-unit plug term. 1
to ignition coil term. 1
- * In case of TD signal, from
control-unit plug term. 1 to
ignition control unit.

If leads O.K., check ignition
system.

Eliminate open circuits/
contact resistances.



261 / 0212

Term. 1 signal from term. 1
ignit. coil (primary signal)

TD signal from ignition
trigger box.



280 / 0831

Continued on next picture page

Component/function:

Main relay, leads/voltage supply of control unit.

N>

* Operation:

Position	
Prog. switch "V"	=>
Prog. switch "Ω"	6
Test button	—

* Measuring equipment:

Motortester or multimeter

* Measuring range:

approx. 20V

* Connection:

Test socket, red (+)

Test socket, black(-)

* Trigger function on veh.:

Ignition "ON"

* Set value (indication):

8...15V

Is measured value inside set-value tolerance?

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter. Remove main relay from plug-in base.

Check the following lead for continuity with ohmmeter, set value approx. 0 Ω :

* From control-unit plug term. 2 to main relay term. 87

* Voltage supply at main relay term. 86 against term. 85

With ignition "on": 8...15V

If not, check lead term. 86 to term. 15 (ignition/starting switch) and ignition/starting switch.

* Check lead term. 85 to vehicle ground.

* Voltage at main relay term. 30 against term. 85: 8...15V

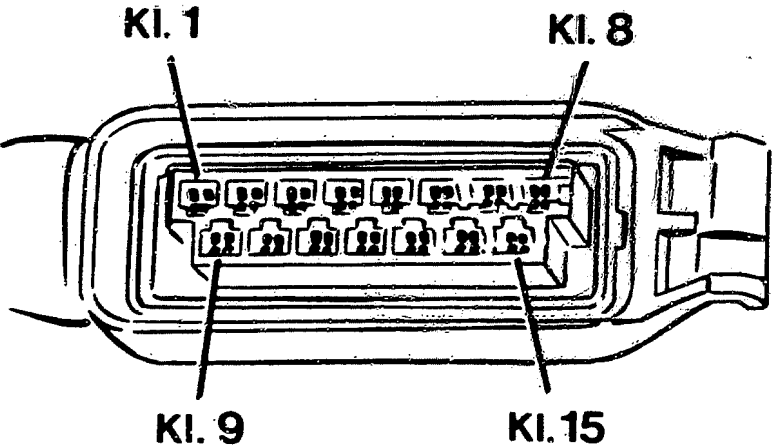
If not, check lead term. 30 to battery (+).

* Connect main relay in plug-in base.

With ignition "on": relay must pull in.

If not => replace main relay.

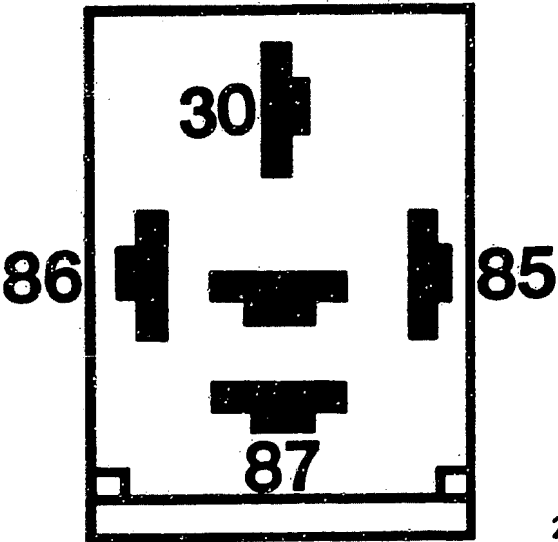
Eliminate open circuits/ contact resistances.



227 / 354

Top view of control-unit plug

Top view of connection base.



280/0936

Component/function:

Pump relay, leads/winding
and voltage supply
(+) of pump relay.

* Operation:	Position
Prog. switch "V"	=>
Prog. switch "Ω"	■
Test button	—

N>

* Measuring equipment:

Motortester or multimeter

* Measuring range:

approx. 20V

* Connection:

Test socket, red (+)
Test socket, black(-)

* Trigger function on veh.:

Ignition "ON"

* Set value (indication):

8...15 V

Is measured value inside
set-value tolerance?

Trouble-shooting:

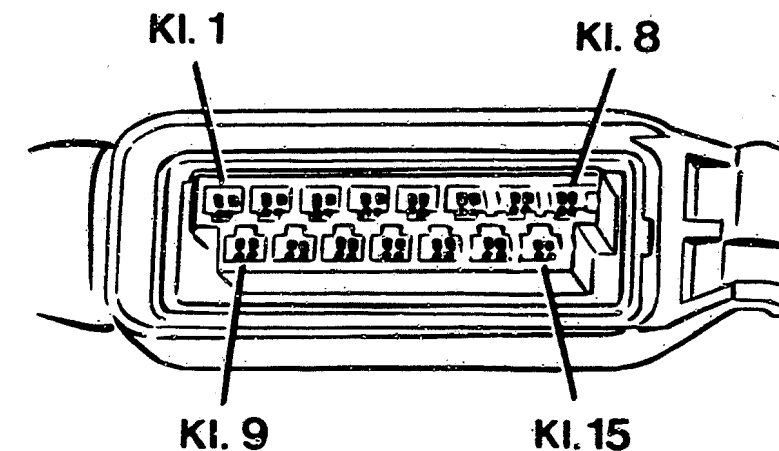
For testing, disconnect
control-unit plug from test
adapter.

Check the following leads
for continuity with ohmmeter,
Set value approx. 0 Ω :

- * From control-unit plug
term. 12 to pump relay
term. 85
- * From pump relay term. 86
to main relay term .87

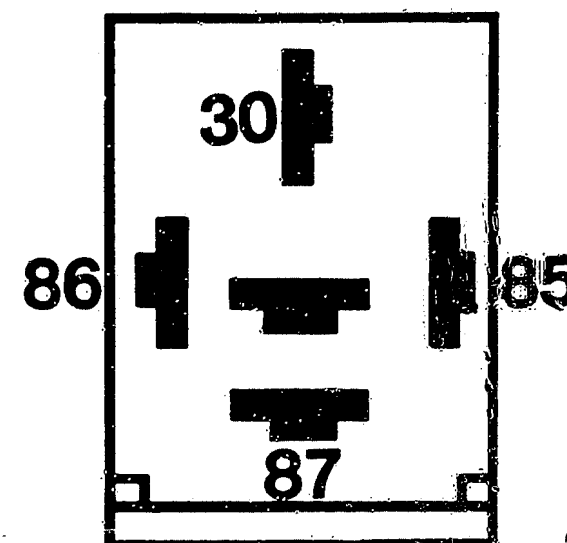
If leads O.K. => replace
pump relay.

Eliminate open circuits/
contact resistances.



227 / 354

Top view of control-unit plug

Top view of connection
base.

280/0936

Continued on next picture page

Component/function:

Pump relay, leads,
electric fuel pump/simulated
actuation of electric
fuel pump

N>

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	3

* Measuring equipment: —

* Measuring range: —

* Connection: —

* Trigger function on veh.:
Detach connector from
auxiliary-air device.
Ignition "ON"

* Set value (indication):
Electric fuel pump must run,
listen to check

Does electric fuel pump
run?

Trouble-shooting:

For testing, disconnect
control-unit plug from test
adapter.

Measure voltage at pump
relay term. 30 to vehicle
ground.

Set value: 8...15V

If not, check the following
leads for continuity with
ohmmeter

Set value approx. 0 Ω .

- * Check lead term. 30 from
pump relay to battery for
continuity.
If lead O.K. => replace
pump relay.

Measure voltage directly
at electric fuel pump.

Connect test adapter.

Press test button 3.

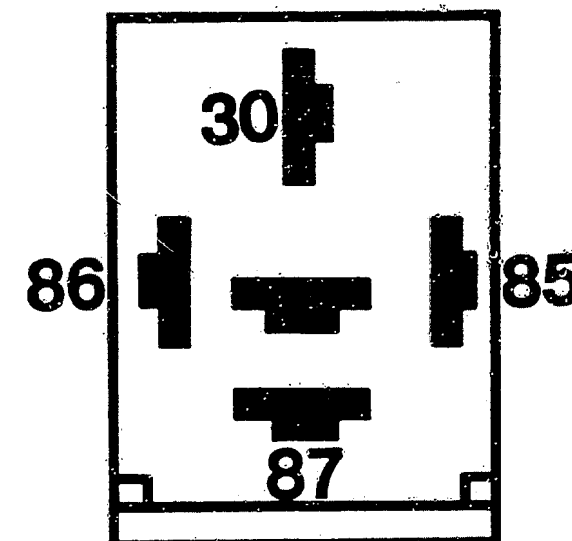
Set value: 8...15 V

If not, check the following
leads for continuity with
ohmmeter

Set value approx. 0 Ω .

- * From electric fuel pump to
pump relay term. 87.
- * From electric fuel pump to
vehicle ground.

If leads O.K. => replace
electric fuel pump.



280/0936

Top view of connection
base.

Continued on next picture page

Component/function:

Auxiliary-air device, leads/
simulation of auxiliary-air device

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	3

N>

* Measuring equipment:
Mirror

* Measuring range: —

* Connection:

Test recess, red (+)
Test recess, black (-)

* Trigger function on veh.:

Attach connector of
auxiliary-air device.
Ignition "On"

* Set value (indication):

Plate must close off
air cross-section.

Is measured value within
set-value tolerance?

Trouble-shooting

Disconnect hoses and look
down auxiliary-air device
(possibly using a small
mirror).

Press test button 3:
Plate must close slowly.
If not, measure voltage
at plug of auxiliary-air
device.

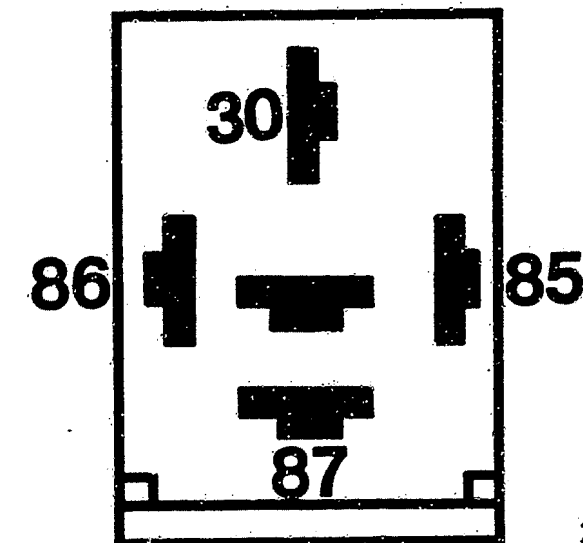
Press test button 3.
Set value: 8...15V

If not, check the following
leads for continuity

Set value approx. 0 Ω :

- * From plug of auxiliary-air
device to ground.
- * From plug of auxiliary-air
device to pump relay term. 87

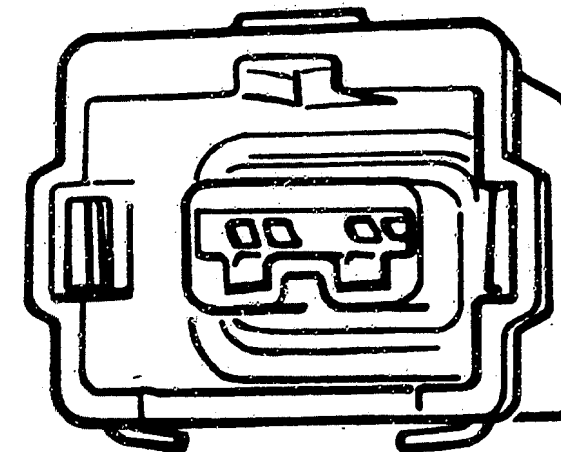
If leads O.K. => replace
auxiliary-air device.
Eliminate open circuits/
contact resistances.



280/0936

Top view of connection
base.

Connector of auxiliary-air
device.



261/793

Continued on next picture page

Component/function:

Connect control unit also.
Ground energization of pump
relay through control unit

* Operation:	Position
Progr. switch "V"	7
Progr. switch "Ω"	10
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
approx. 20 V

* Connection:
Red test socket (+)
Black test socket (-)

* Operation in vehicle:
Let engine run.

* Set value (reading):
0...5V

Is measured value within
set-value tolerance?

Trouble-shooting:

Pump relay must pull in when
starting.

If not => replace control
unit.

See also Coordinate
A19/20

Eliminate open circuits/
contact resistances.

N>

Continued on next picture page

Component/function:

Additionally connect control unit.
Air-flow sensor, control unit/
air-flow signal at Up output
term. 11.

* Operation:	Position
Prog. switch "V"	8
Prog. switch "Ω"	10
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
Approx. 10V

* Connection:
Test socket, red (+)
Test socket, black (-)

* Trigger function on vehicle:
Let engine run

* Set value (indication):
0...5V load-dependent

Is measured value within
set-value tolerance?

N>

Trouble-shooting:

For test purposes, detach
control-unit plug from test adapter.

Test air-flow sensor
separately.
To do so, detach control unit.
See Coordinate A19/20

Test air-flow sensor:
Resistance between term. 3
and term. 4
Set value: 500...1000 Ω

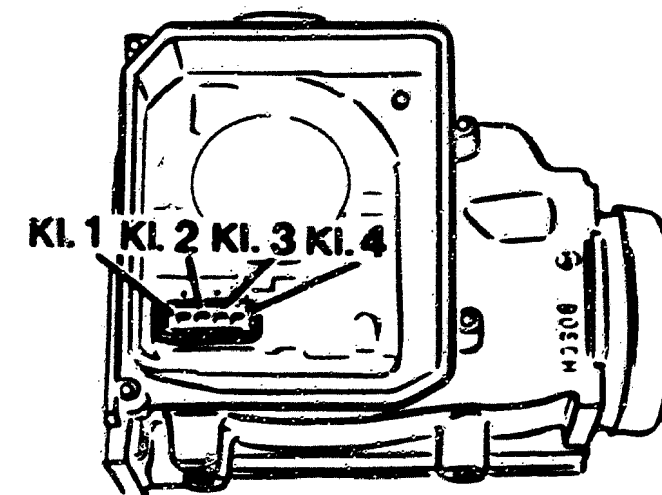
Resistance between
term. 3 and term. 2
Sensor flap in off position.
Set value: 10...200 Ω
The indication must change
when the sensor flap is deflected.

Test intake-air temperature
sensor:
Resistance between term. 3 and
term. 1
Set value:
at ambient temperature,
+15...+30°C: 1.45...3.3k Ω

If a set value is not
attained => renew air-flow
sensor.

If set value is attained =>
renew control unit.
Refer to Coordinate A19/20

Eliminate open-circuit/
contact resistance.



280 / 1349

Continued on next picture page

Component/function:

Additionally connect control unit.

1. Pressure sensor, leads/potentiometer voltage of altitude sensor.
2. If no pressure sensor is fitted, term. 7 and term. 2 must be jumpered.

* Operation:	Position
Prog. switch " V "	9
Prog. switch " Ω "	10
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
approx. 20V

* Connection:
Test socket, red (+)
Test socket, black (-)

* Trigger function on veh.:
Let engine run

* Set value (indication):

1. At 980 mbar (300m) : 2...4 V
At 615 mbar (4000m) : 8...12 V
2. If term. 7 and term. 2 are jumpered: 8...15 V

Is measured value within set-value tolerance?

Trouble-shooting:

For test purposes, detach control-unit plug from test adapter.

1. Measure resistance directly at altitude sensor,
between term. 2 and term. 3
Set value: 2.3...2.8 k Ω
between term. 2 and term. 1
Set value: 2.0...2.7 k Ω

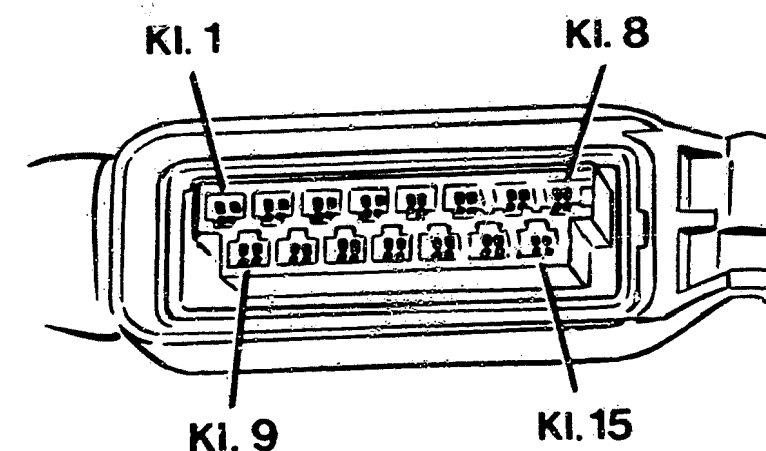
If set values are not attained => renew altitude sensor.

Use ohmmeter to test following leads for continuity

Set value approx. 0 Ω :

- * From altitude sensor term. 1 to control-unit plug term. 7
 - * From altitude sensor term. 3 to main relay term. 87
 - * From altitude sensor term. 2 to vehicle ground.
2. Between control-unit plug term. 7 and term. 2.

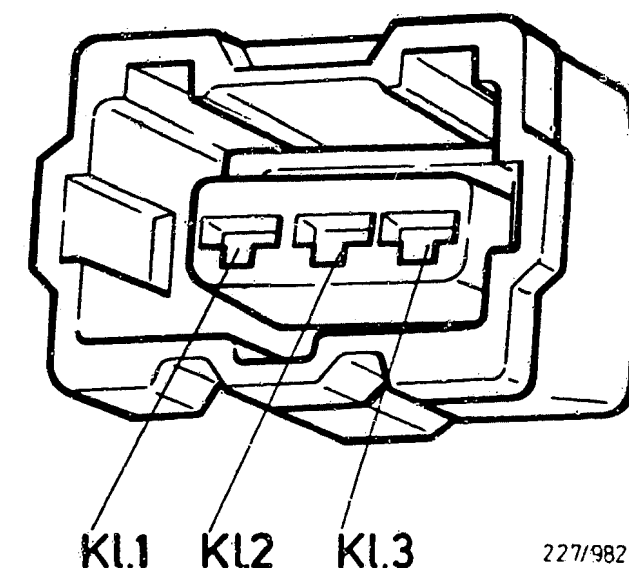
Eliminate open-circuits/contact resistance.



227 / 354

Top view of control-unit plug

Top view of plug of altitude pickup



227/982

Continued on next picture page

Component/function:

Additionally connect control unit.
Injection valves, control unit, leads/injection pulses from control unit.

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	10
Test button	—

* Measuring equipment:
Motortester, oscilloscope

* Measuring range:
Special input 20 V

* Connection:
Test recess, red (+)
Test recess, black (-)

* Trigger function on veh.:
Let engine run

* Set value (indication):
Injection pulses on oscilloscope

Are injection pulses visible?

N>

Trouble-shooting:

For testing, disconnect control-unit plug from test adapter.

Resistance between control-unit plug term. 3 and pump relay term. 87

Set value:

4-cyl. engine: 3.5...5.0 Ω

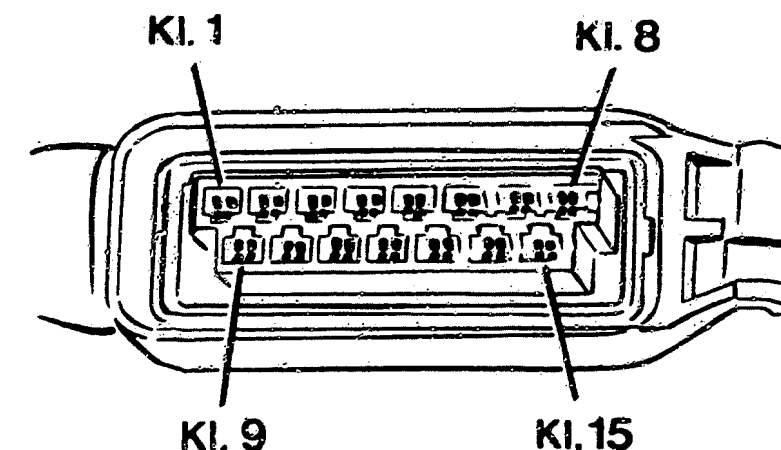
6-cyl. engine: 2.2...3.5 Ω

If set value not obtained, measure resistances of injection valves individually.
Set value: 14.5...17 Ω
If set value not obtained
=> replace injection valve.

If set value obtained, check the following leads for continuity with ohmmeter.
Set value approx. 0 Ω

- * From control-unit plug term. 3 to the individual connectors of the injection valves.
- * From pump relay term. 87 to the individual connectors of the injection valves.

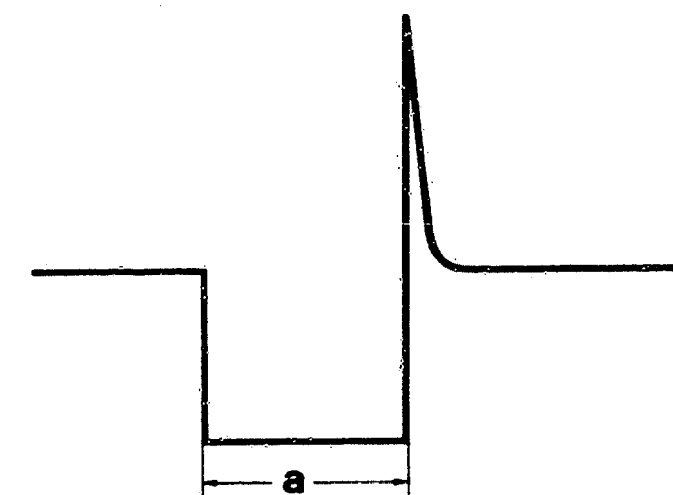
If leads O.K. => replace defective control unit.
See also Coordinate A19/20
Eliminate open circuits/contact resistances.



227 / 354

Top view of control-unit plug

Injection pulses of a switched output stage (measured at the injection valve)
a = Pulse length (dependent on engine load)



280/0249

Continued on next picture page

Component/function:

Additionally connect control unit.
Lambda sensor, leads/sensor
monitoring

* Operation:	Position
Prog. switch "V"	
Prog. switch "Ω"	
Test button	

* Measuring equipment:
Motortester or multimeter

* Measuring range:
approx. 20V

* Connection:
Test socket, red (+)
Test socket, black (-)

* Trigger function on veh.:
Run engine at operating
temperature approx. 80°C

* Set value (indication):
0...1.0 V

Is measured value within
set-value tolerance?

Trouble-shooting:

Use ohmmeter to test following
leads for continuity
approx. 0 Ω ,

- * From heater plug to
pump relay term. 87.
- * From heater plug to
vehicle ground.
- * From sensor housing
to vehicle ground.
Detach control-unit
plug.
From sensor plug to
control-unit plug term. 13.

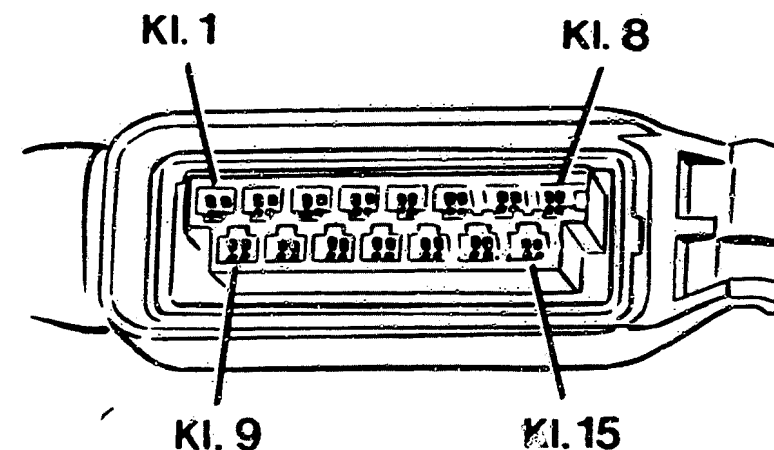
Test shield term. 5 to sensor
lead term. 13,
resistance at least 1 M Ω .
Attach control-unit plug.

Run engine at operating temperature
If set value is now
attained → continue with
next micro-picture.

If reading is 8...15 V →
test sensor heater,
internal resistance: 1...15 Ω .

Use digital multimeter
(R1 greater than 1 M Ω) to measure
sensor signal with respect to ground.
Sensor voltage: 0.05...1.0 V.
If a value is not attained
→ renew lambda sensor.

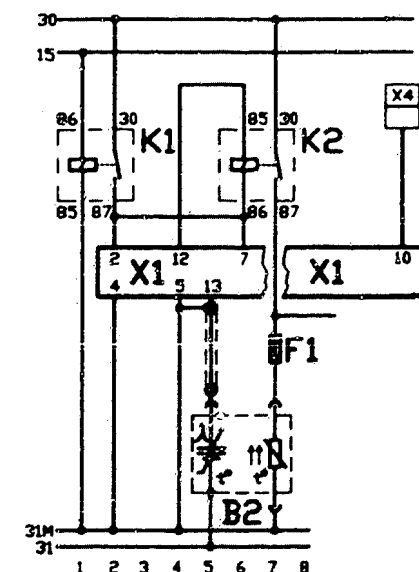
Only coat sensor thread with a
small amount of grease Vs 140 16 Ft.



227 / 354

Top view of control-unit plug

B2 = Heated lambda sensor
K1 = Main relay
K2 = Pump relay
X1 = Control-unit plug
X4 = Test output for
lambda closed-loop control
(Diagnosis output)



S2801531

Continued on next picture page

Component/function:

Additionally connect control unit.
Control unit, leads/reference
voltage UV-output to term. 9.

* Operation:	Position
Prog. switch "V"	12
Prog. switch "Ω"	10
Test button	—

* Measuring equipment:
Motortester or multimeter

* Measuring range:
approx. 10 V

* Connection:
Test socket, red (+)
Test socket, black (-)

* Trigger function on veh.:
Run engine

* Set value (indication):
3.5...4.5 V

Is measured value within
set-value tolerance?

N>

Trouble-shooting:

For testing, disconnect
control-unit plug from
test adapter.

Disconnect the loads (e.g.
ignition control unit)
connected to control unit
term. 9.

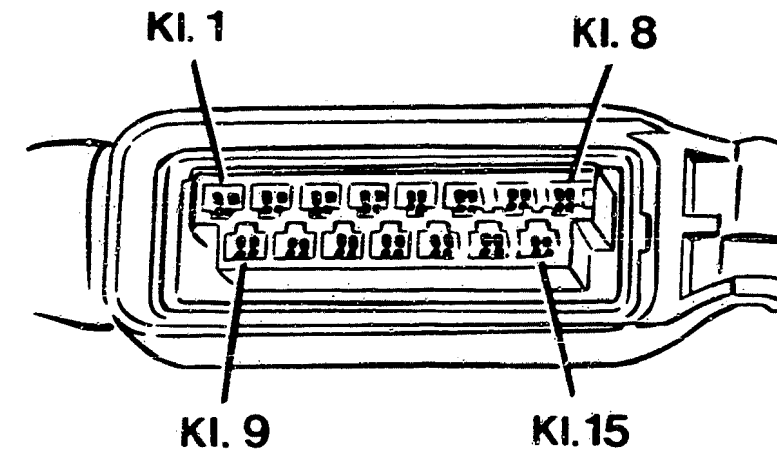
Measure shielded lead at
control unit term. 9 to
vehicle ground.

Set value: infinity Ω

Is set value now obtained?
If yes → check loads.
If not → replace defective
control unit.

See also Coordinate A19/20

Eliminate open circuits/
contact resistances.



227 / 354

Top view of control-unit plug

Continued on next picture page

Component/function:

Connect control unit also.
Simulation of cold engine

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	1

N>

Trouble-shooting:

If set value not obtained
=> replace control unit.

See also Coordinate A19/20

* Measuring equipment:

Motortester, oscilloscope

* Measuring range:

Special input 20 V

* Connection:

Red test wells (+)

Black test wells (-)

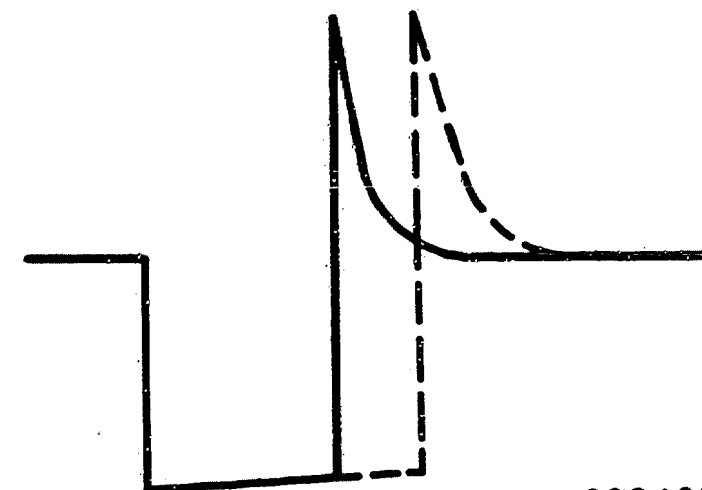
* Operation in vehicle:

Let engine run

* Set value (reading):

Injection pulse must become
wider, or engine speed must
drop.

Does injection pulse
become wider?



280/0918

Wider injection signal
after pressing button T 1

Continued on next picture page

TEST STEP 17

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

V

Component/function:

Connect control unit also.
Simulation of warm engine

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	2

N>

Trouble-shooting:

If set value not obtained
=> replace control unit.

See also Coordinate A19/20

* Measuring equipment:

Motortester, oscilloscope

* Measuring range:

Special input 20 V

* Connection:

Red test wells (+)

Black test wells (-)

* Operation in vehicle:

Let engine run

* Set value (reading):

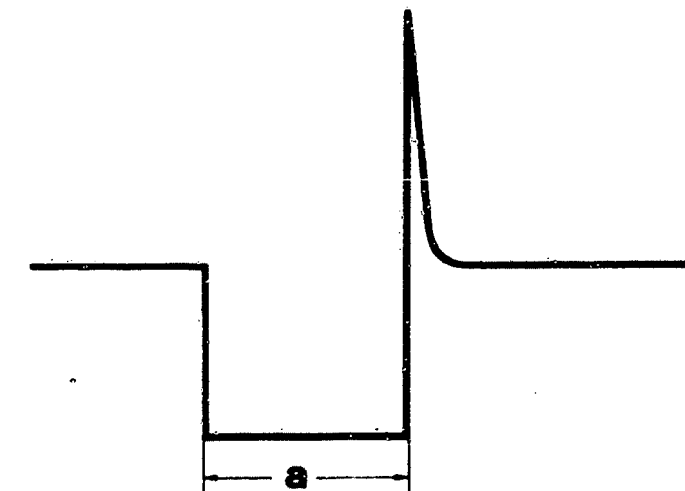
Injection pulse must not
become wider

Does injection pulse
remain the same?

Y

V

Continued on next picture page



280/0249

Injection pulses of a switched
output stage (measured at the
injection valve)
a = Pulse length (dependent
on engine load)

V

Component/function:

Connect control unit also.
Simulation of overrun cutoff

* Operation:	Position
Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	5

N>

Trouble-shooting:

If set value not obtained
=> replace control unit.

See also Coordinate A19/20

* Measuring equipment:

Motortester, oscilloscope

* Measuring range:

Special input 20 V

* Connection:

Red test wells (+)

Black test wells (-)

* Operation in vehicle:

Engine speed above
2000 min⁻¹

* Set value (reading):

Injection pulse stops/engine
hunts

Do injection pulses stop?

Y

V

Continued on next picture page

V

Component/function:

Connect control unit also.

Simulation of full-load enrich.

* Operation:

Progr. switch "V"	10
Progr. switch "Ω"	10
Test button	6

* Measuring equipment:

Motortester, oscilloscope

* Measuring range:

Special input 20 V

* Connection:

Red test wells (+)

Black test wells (-)

* Operation in vehicle:

Engine speed above 2000 min⁻¹

* Set value (reading):

Slight change in injection pulse/engine speed.

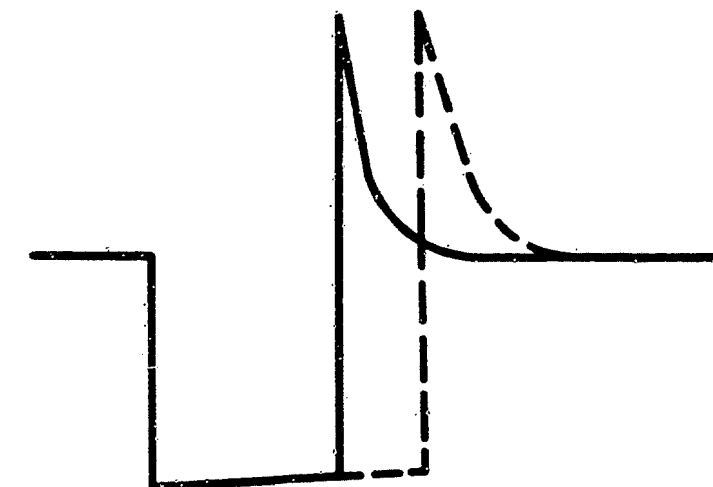
Change in pulse/engine speed?

N>

Trouble-shooting:

If set value not obtained
=> replace control unit.

See also Coordinate A19/20



280/0918

Changed injection signal
after pressing button T 6.

Y

V

Continued on next picture page

Component/function:

Additionally connect control unit.
Measurement output, lambda
closed-loop control
(Mixture control)

* Operation:	Position
Prog. switch "V"	10
Prog. switch "Ω"	11
Test button	4

* Measuring equipment:

Motortester or multimeter

* Measuring range:

Approx. 20 V

* Connection:

Test socket, red (+)
Test socket, black (-)

* Trigger function on veh.:

Run engine at operating
temp., approx. +80°C

* Set value (indication):

Uniformly fluctuating
indication between 0...13 V.

Is measured value within
set-value tolerance?

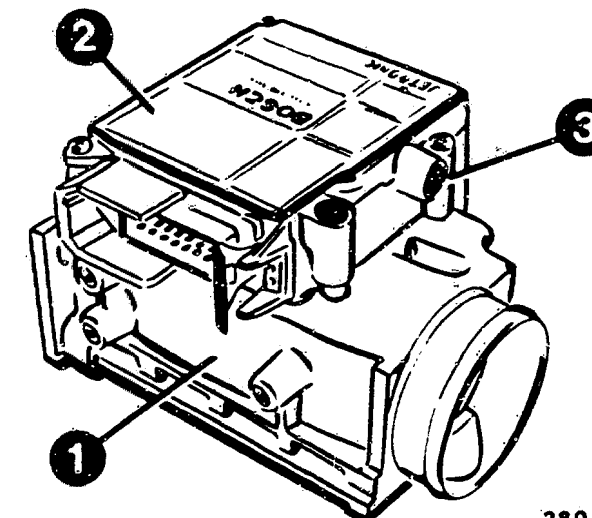
N>

Trouble-shooting:

If set value is not
attained, ensure that exhaust
system is not leaking.

Perform adjustment as
follows:

Lever out large securing cap
(on side of control unit).
Turn CO adjusting screw until
voltage reading fluctuates
uniformly between 0...13 V.
Press in new securing
cap.



280 / 1366

- 1 = Air-flow sensor
2 = Control unit
3 = Anti-tamper cap for
CO adjusting screw

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (1)

Check air-intake system

Are all hoses correctly connected, not kinked or damaged?
Is oil dipstick pressed all the way in? Is lid seal on oil filler neck O.K.?

Are all hoses O.K.?

N>

Replace hoses if necessary.
Re-tighten hose binders.

Push in oil dipstick firmly.
Replace lid seal on oil filler neck.

Leak test

Seal off exhaust tail pipe.
Unscrew air-flow sensor from air-filter housing and seal off air-flow sensor duct.
Remove hose after auxiliary-air device and seal off connection port on auxiliary-air device.
Fully open throttle valve.

Using a compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold.
Spray or brush all joints with leak-detector spray or soapy water.

Are all joints leak-tight?

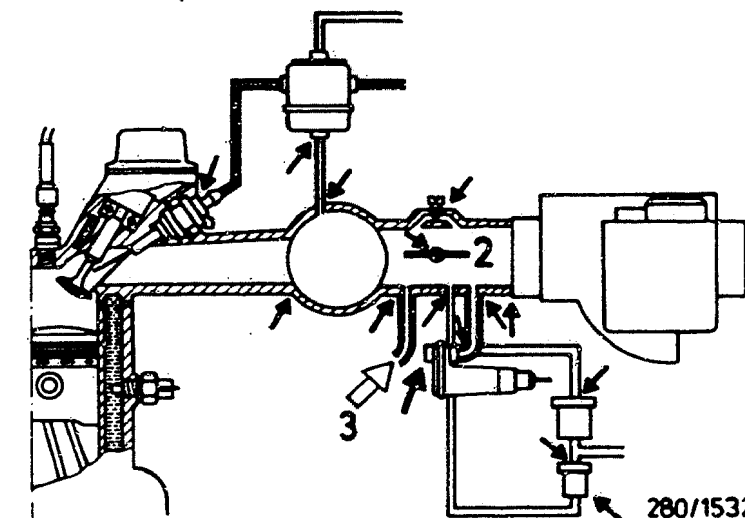
N>

Bubbles or the formation of foam give an indication of leaks.

Eliminate leaks by using new seals or tightening tie bands.

Leaks can also occur at the following points:
throttle-valve mount,
intake-manifold seal,
tank ventilation system
and auxiliary units
(e.g. brake booster)
which make use of intake-manifold pressure.

Return to trouble-shooting chart B03



1 = Sealing
2 = Open throttle valve fully
3 = Blow in air
Small arrows = Possible leaks

TROUBLE-SHOOTING PROGRAM (2)

Test auxiliary-air device

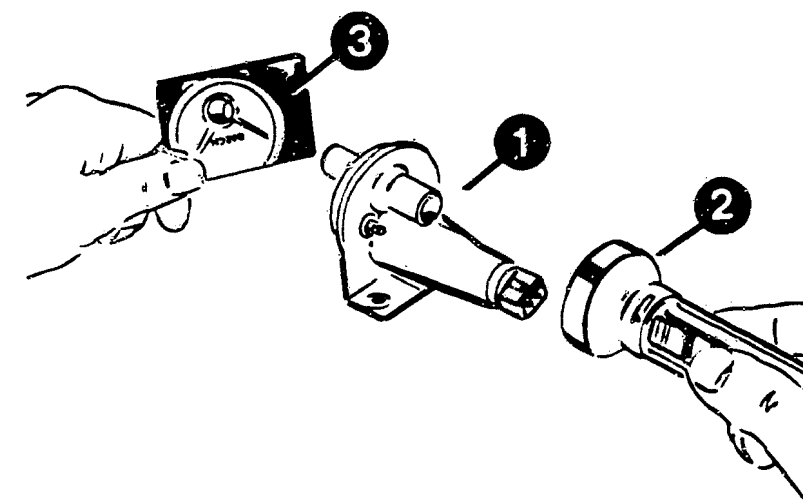
With cold engine:
Detach hose to auxiliary-air device. Engine speed must decrease.

With warm engine:
Disconnect hose. Engine speed may only drop imperceptibly.
Take care not to damage hose.

Visual inspection: Detach hoses and inspect them using if necessary a small mirror and a lamp. With a cold engine the cross-section must be partly open, with a warm engine it must be closed.

Are functions attained?

Replace auxiliary-air device



438 / 0375

1 = Auxiliary-air device
2 = Hand lamp
3 = Mirror

Disconnect connector from auxiliary-air device.
Measure resistance directly at auxiliary-air device
Set value: see brief instructions

Set value obtained?

Replace auxiliary-air device

After testing is finished

Connect hoses on auxiliary-air device.
Make sure there are no leaks.

Connect connector on auxiliary-air device.

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (3)

Check air-flow sensor for freedom of movement

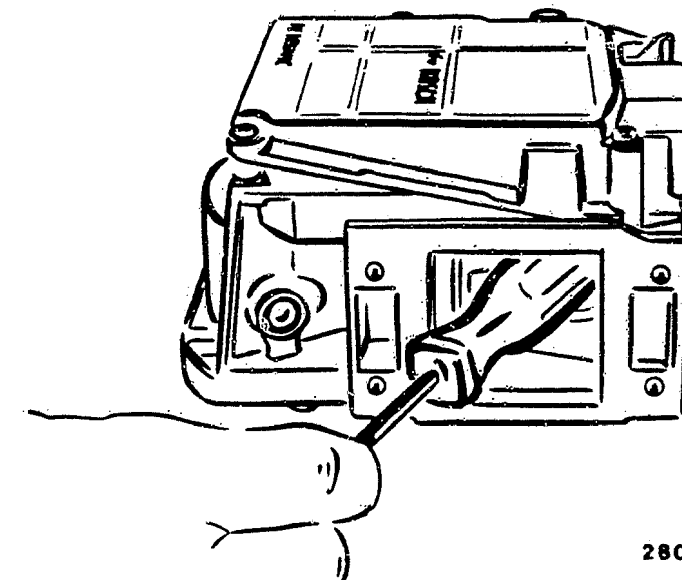
Unlatch 15-pin plug and remove. Remove measuring and control unit from air-filter housing and loosen air hose. It must be possible for the air-flow sensor flap to be moved with uniform ease from stop to stop; when released, the flap must close again by itself.

Sensor flap must not catch. Watch for signs of abrasion or rubbing. If very dirty, clean air duct with lint-free cloth.

Does air-flow sensor flap move freely?

N>

If there are signs of rubbing visible in the housing, if air-flow sensor flap is sticking or bent => replace air-flow sensor. To do this, remove control unit for further use. See also Coordinate A19/20



280 / 1352

Deflect air-flow sensor flap

Continued on next picture page

Electrical test of air-flow sensor.

To do this, remove control unit from air-flow sensor.
See also Coordinate A19/20

Check potentiometer:
Connect ohmmeter to term. 3 and term. 4 of air-flow sensor.
Set value: 500...1000 Ω

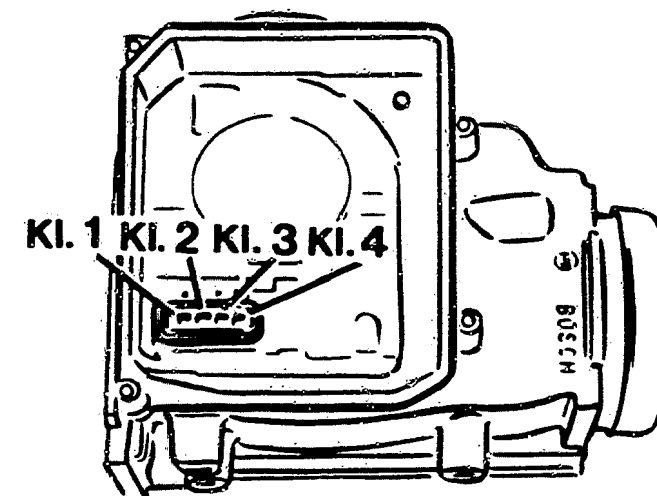
Resistance between term. 3 and term. 2, sensor flap in rest position
Set value: 10...200 Ω
The reading must change when the sensor flap is deflected.

Check temperature sensor (intake-air):
Resistance between term. 3 and term. 1.
Set values:
at ambient temperature,
+15...+30 °C: 1.45...3.3 k Ω
with engine at operating temp.,
approx. + 80° C : 280...360 Ω

Set values obtained?

N>

Potentiometer or temperature sensor (intake-air) defective
=> replace air-flow sensor.
To do this, remove control unit for further use.
See also Coordinate A19/20



280 / 1349

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (3) CONTINUED (2)

V

Mount control unit on air-flow sensor.

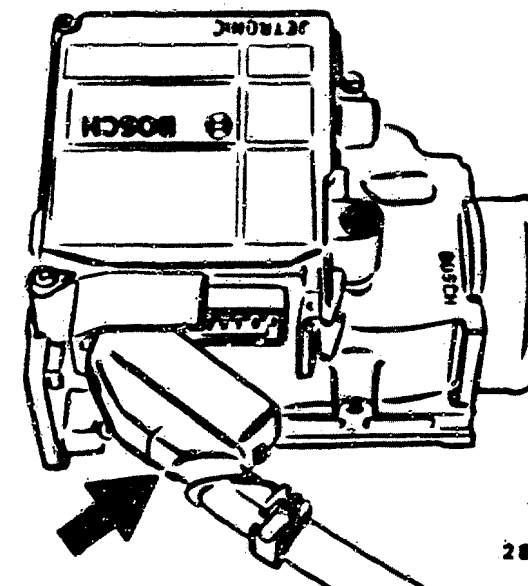
See also Coordinate A19/20

Screw measuring and control unit onto air-filter housing and mount air-guide hose. Connect 15-pin plug and latch in.

After installing a new air-flow sensor, perform idle adjustment. See Coordinate D25/26

V

Return to trouble-shooting chart B03



280/1353

TROUBLE-SHOOTING PROGRAM (4)

Check fuel delivery.

Measure fuel delivery of electric fuel pump against pressure. Therefore, measuring point at return, after pressure regulator.

Disconnect fuel-return hose from pressure regulator.
Mount test hose on pressure regulator and lead into a 1.5 l measuring glass.
Disconnect pump relay.
Connect jumper into connection base between term. 87 and term. 30.
The electric fuel pump must operate. Measuring time 30 sec.

Fuel delivery

SET VALUE: See brief instructions

Set value obtained?

After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove test hose and mount fuel return hose on pressure regulator. Make sure there are no leaks.

Return to trouble-shooting chart B03

*Fuel filter very dirty
→ replace.

*Fuel delivery line or pressure damper (if applicable) clogged → replace.

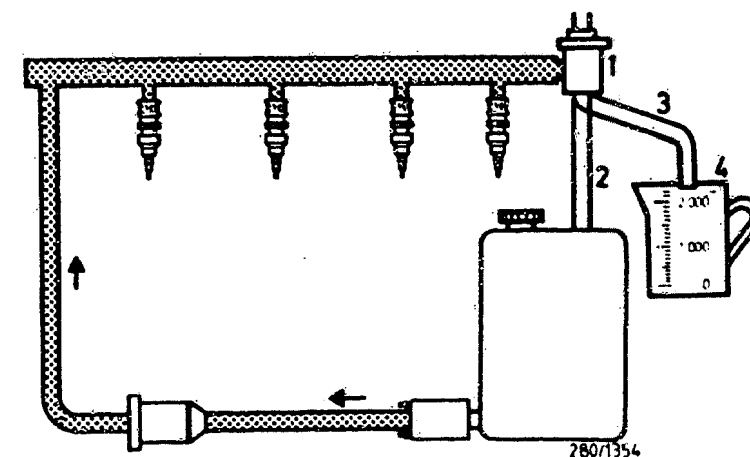
*Voltage at electric fuel pump, with engine running, min. 12 V. If not, clean contacts, eliminate poor ground connection, replace leads.

*Check pre-supply pump (if applicable). Measuring point: line between the pumps. Fuel delivery must be at least 10% greater than that of the electric fuel pump. If not → replace pre-supply pump.

*If fuel-pump delivery too low → replace electric fuel pump. Clean joints before loosening so that no dirt gets into the fuel system. In-tank electric fuel pumps are accessible via a closure on the tank.

*If electric fuel pump loud (vapor locks) intake line constricted or kinked → replace.
Strainer in tank clogged → replace.
Corrosion in tank → clean/replace.

*Pressure regulator defective - check.
See next coordinate:



Pressureless

Fuel pressure

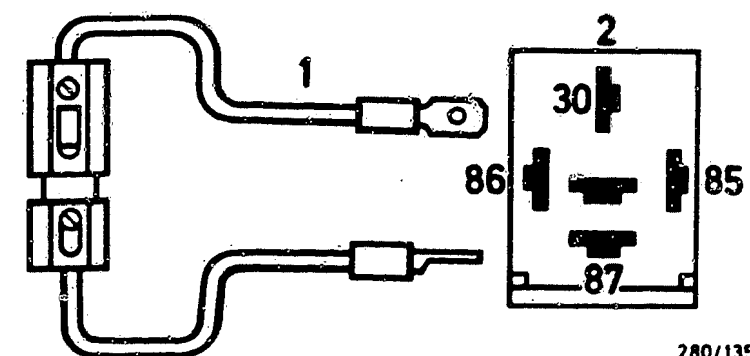
1 = Pressure regulator

2 = Return

3 = Test hose

4 = Measuring glass

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)
2 = Top view of connection base



TROUBLE-SHOOTING PROGRAM (5)

Test fuel pressure with engine stopped.

N>

Measure pressure ahead of pressure regulator. Measurement point at inlet of fuel distribution pipe, at hose connection or at pressure damper (if provided)

Detach fuel supply hose.

CAUTION!

Catch fuel as it emerges; fuel must not be allowed to get on to hot parts of engine. Connect pressure measuring device KDJE-P100, close valve screw. For connection purposes, make use of 3-way line KDJE-P100/13 (hose connection) and connection part KDJE-P100/14 (screw connection M14x1.5) or KDJE-P100/16 (screw connection M16x1.5). Make sure connection is tight.

Fit jumper between term. 87 and term. 30 in connection socket (for pump relay). Electric fuel pump must run.

Fuel pressure
SET VALUE: See brief instructions

Is set value attained?

Y
V

Continued on next picture page

Set value is not reached:

Slowly pinch off fuel return line.
Caution! Do not increase pressure to in excess of 6 bar.

*If pressure increases to in excess of 5 bar → renew pressure regulator.
Use new O-rings with O-ring sealing technique. Lubricate with a small quantity of engine oil (e.g. HD 30).

Pressure does not increase sufficiently:

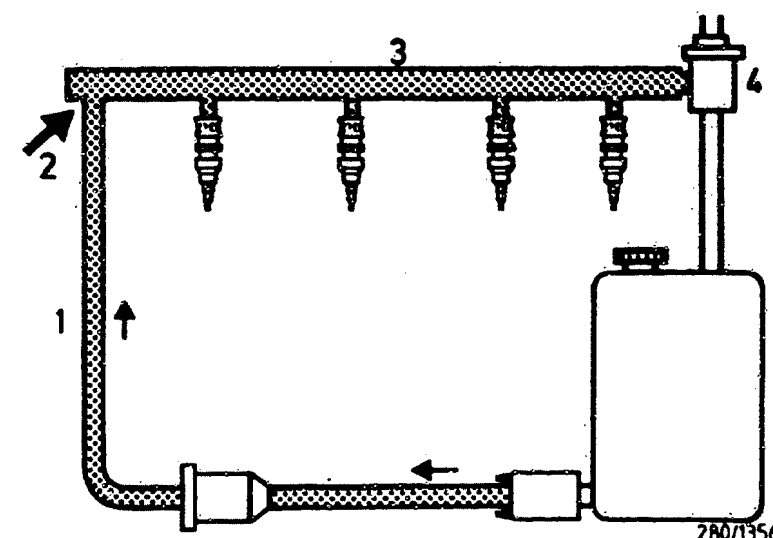
*Fuel filter heavily clogged, renew.
*Fuel delivery line or pressure damper (if provided) clogged → renew.
*Electric fuel pump defective → renew.
*Strainer in tank clogged.
Corrosion in tank.

Set value exceeded:

Detach fuel return hose from pressure regulator. Attach test hose to pressure regulator and route it into a 1.5 l measuring jug.

Is set value now attained?

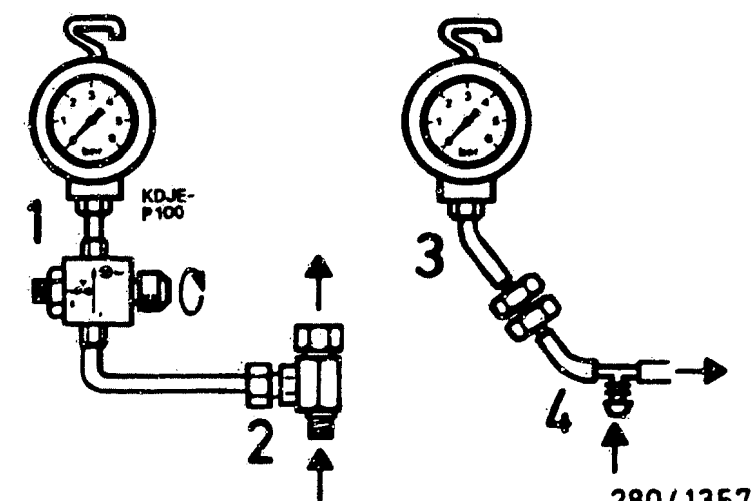
*If yes, fuel return line clogged or crushed → renew.
*If not, pressure regulator defective → renew.



Pressureless

Fuel pressure

1 = Inlet, delivery line
2 = Measuring point
3 = Fuel-distribution pipe
4 = Pressure regulator
1 = Pressure tester
2 = Connec. part KDJE-P100/14
3 = Pressure gauge with hose line
4 = Three-way line KDJE-P100/13



TROUBLE-SHOOTING PROGRAM (5) CONTINUED (1)

Check fuel pressure with engine running.

Let engine idle.

Fuel pressure
SET VALUE: approx. 0.5 bar
lower than with engine stopped.

Set value obtained?

N>

*Intake-manifold-pressure energization of pressure regulator not O.K. Hose line between pressure regulator and intake manifold clogged or leaking → replace.
Hose line dropped off → re-connect.

*If intake-manifold-pressure energization O.K. → replace pressure regulator.

Check fuel pressure after switching off engine (checking for leaks).

Fuel pressure
SET VALUE: min. 1.0 bar
after 20 minutes.

Set value obtained?

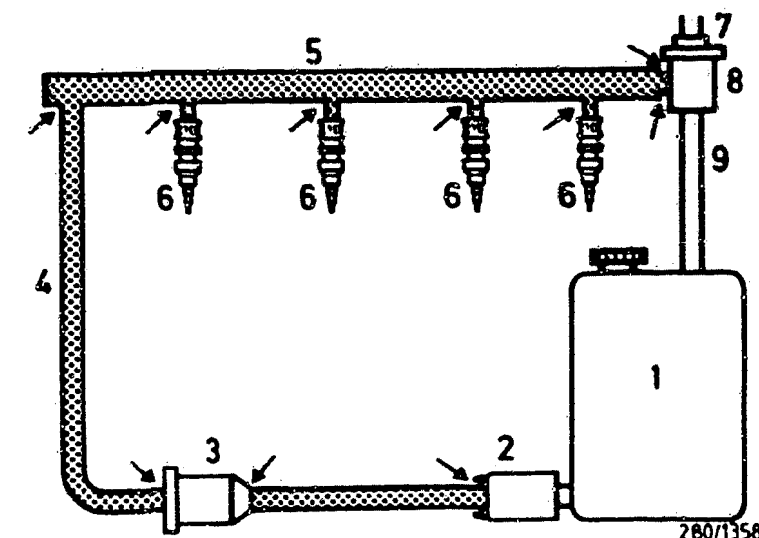
N>

*Leaking at joints between components, fuel hoses and fuel lines → tighten hose binder or replace hose.

*Pressure regulator (diaphragm) leaking → replace.

*Electric fuel pump (non-return valve) leaking.
With screw-type non-return valve → replace.
With integral non-return valve → replace electric fuel pump.

*Pressure damper or fuel filter leaking → replace.



- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Inlet, delivery line
- 5 = Fuel-distribution pipe
- 6 = Injection valves
- 7 = Intake-manifold pressure connection
- 8 = Pressure regulator
- 9 = Return line

Arrows = Possible leaks

Continued on next picture page

Continued on next picture page

*Leak in injection valve(s)
at point of connection with
fuel distributor; renew
O-ring. See text below.

*Check injection valve(s)
(needle seat) for leaks:

Remove complete fuel distributor.
Supply and return remain
connected. Simultaneously
pull all injection valves
out of intake-manifold guide.

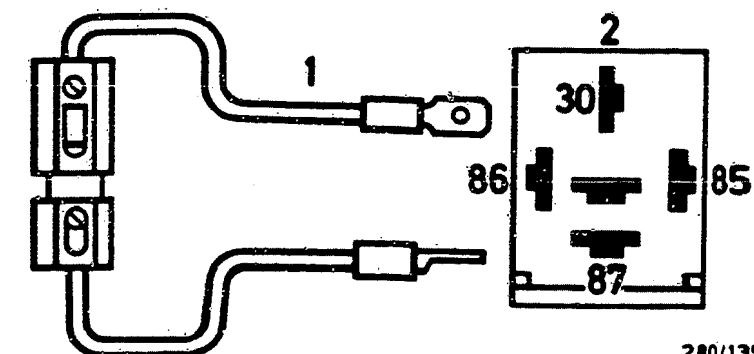
Fit jumper between term. 87
and term. 30 in connection
frame (pump relay).
Electric fuel pump must
run.

Set value:

No droplets may drip off the
injection valve within 60 s.
If they do so, renew injection
valve.

Removal:

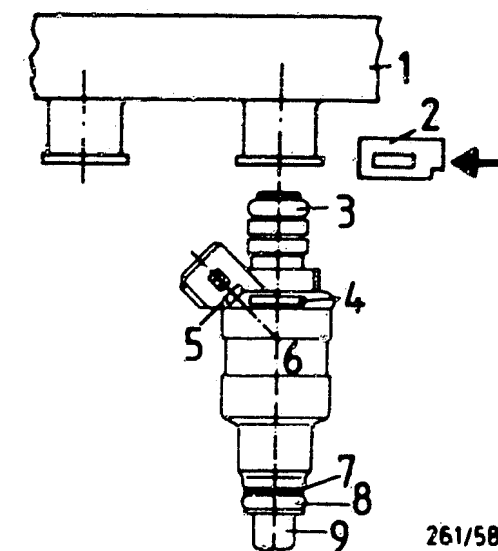
Detach connector.
Pull out retaining clip.
Remove injection valve.
Caution!
Catch any fuel which emerges.
It must not be allowed to make
contact with hot engine components.



280/1359

1 = Jumper with fuse holder
and 10 A fuse (user-
fabricated)
2 = Top view of connection
base

1 = Fuel-distribution pipe
2 = Holding clamp
3 = Upper O-ring
4 = Part number
5 = Date of manufacture
6 = Injection valve
7 = Supporting plate
8 = Lower O-ring
9 = Protective sleeve



261/585

Continued on next picture page

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (5) CONTINUED (3)

If there is no injection valve leakage (needle seat), but O-ring is defective, renew O-ring.

Use new parts set.
Caution! Do not damage protective sleeve and valve needle

If upper O-ring (fuel distribution pipe) is damaged, renew it.

If lower O-ring (intake manifold) is defective, cut it up.
Fit new O-ring over protective sleeve and its beading.

Fitting:
Slightly lubricate O-rings only with engine oil (e.g. HD 30).
Attach injection valve to fuel distribution pipe.
Insert retaining clip into groove and engage it.
Test for fuel leakage.
Attach connector.

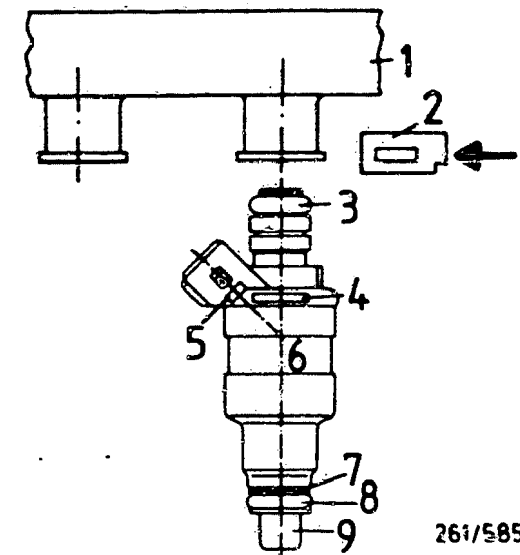
Fit complete fuel distribution pipe. In doing so, simultaneously press all injection valves into intake manifold guide.
Important!
Do not damage O-rings or valve needles.
Make sure intake manifold is not leaking.

After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove pressure tester.
Connect fuel-inlet hose to fuel-distribution pipe.
Make sure there are no leaks.

Return to trouble-shooting chart B03



261/585

- 1 = Fuel-distribution pipe
- 2 = Holding clamp
- 3 = Upper O-ring
- 4 = Part number
- 5 = Date of manufacture
- 6 = Injection valve
- 7 = Supporting plate
- 8 = Lower O-ring
- 9 = Protective sleeve

TROUBLE-SHOOTING PROGRAM (6)

Increased noise from electric fuel pump.

N>

In case of:

-high outside temperatures,
-high fuel temperatures,
-fuel tank almost empty,
-lengthy full-load driving or
-at idle,
-use of winter fuel at warmish
outside temperatures,
vapor locks in the intake line
may lead to noises at the
electric fuel pump.

Are pump noises normal?

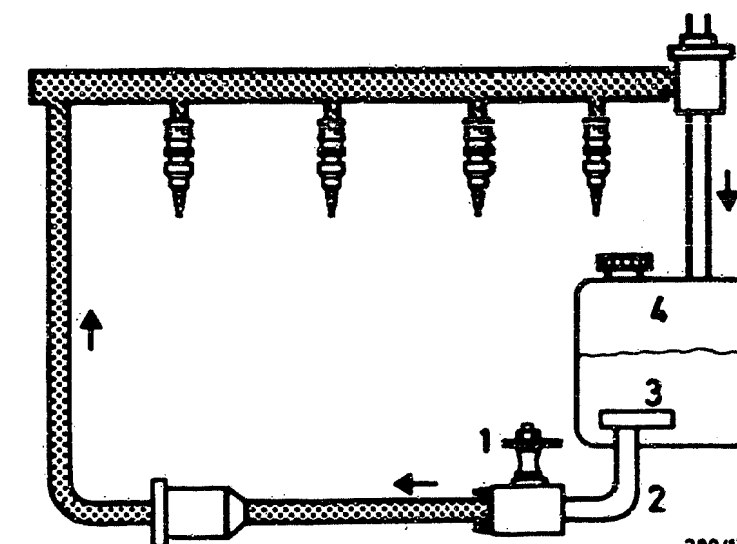
*Pump suspension (vibration
damper) defective ->
replace.

*Intake line constricted or
kinked -> replace.

*Strainer in fuel tank clogged
-> replace.

*Intake or delivery line
transmitting pump noises to
vehicle body -> lay lines so
that they are free of tension,
or replace if necessary.

*If fuel tank almost empty ->
fill up.



280/1361

1 = Pump mounting
2 = Intake line
3 = Intake strainer
4 = Fuel level

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (7)

Check solenoid-operated injection valves with engine running.

With engine running, disconnect injection-valve connectors, individually one after the other, from the injection valves and re-connect.

Engine speed must noticeably drop if injection valve is O.K.

Set value: drop in engine speed

Set value obtained?

N>

No drop in engine speed => renew corresponding solenoid-operated injection valve.

Remove complete fuel distribution pipe.

Caution!

Catch fuel as it emerges; fuel must not be allowed to get on to hot parts of engine. Simultaneously pull all injection valves out of intake-manifold guide.

Removal:

Detach connector.

Pull out retaining clip.

Remove injection valve.

Installation:

Lubricate O-rings only with a small quantity of engine oil (e.g. HD 30).

Attach injection valve to fuel distribution pipe.

Insert retaining clip into groove and engage it.

Test for fuel leakage.

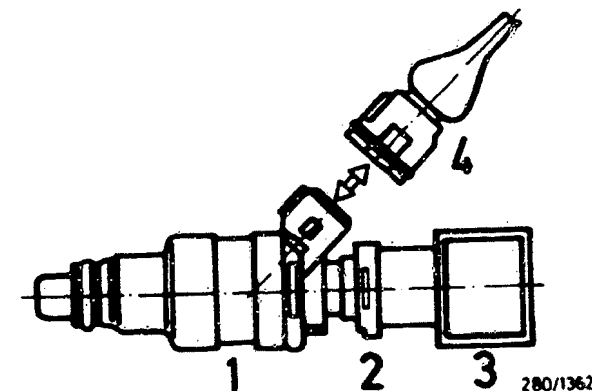
Attach connector.

Install complete fuel distribution pipe. In doing so, simultaneously press all injection valves into intake-manifold guide.

Caution!

Take care not to damage O-rings or valve needles.

Make sure there is no int.-man. leak.



1 = Injection valve

2 = Holding clamp

3 = Fuel-distribution pipe

4 = Connector

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (8)

Check interference and missing.

Connect the two-pole test lead 1 684 463 093 between an injection valve and its connector.
Connect motortester (special input) to test lead. Black clamp to vehicle ground.
Connect red clamp to one of the two connections of the test lead.

Caution: the free terminal of the test lead must not come into contact with ground.

Let engine run.

If correctly connected, injection pulses will be visible on the oscilloscope (diagram opposite).

Set value: injection pulses

Set value obtained?

N>

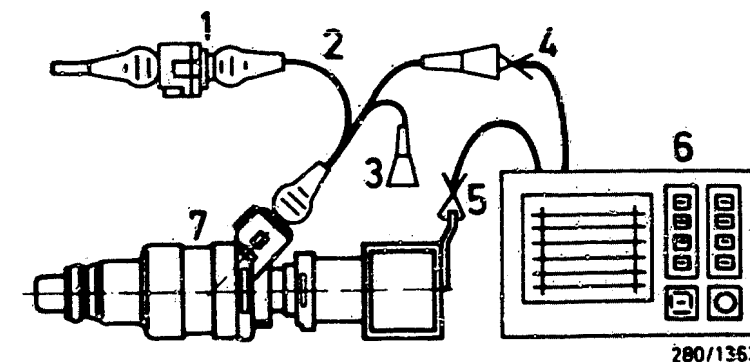
Check connections.
Connect the red clamp from the motortester to the other connection of the test lead.

The free connection must not come into contact with ground.

If there are deviations from the set value, the other injection valves should also be examined.

In the case of interference, check the routing of the leads, i.e. ignition cables should be kept clear of the wiring harness.

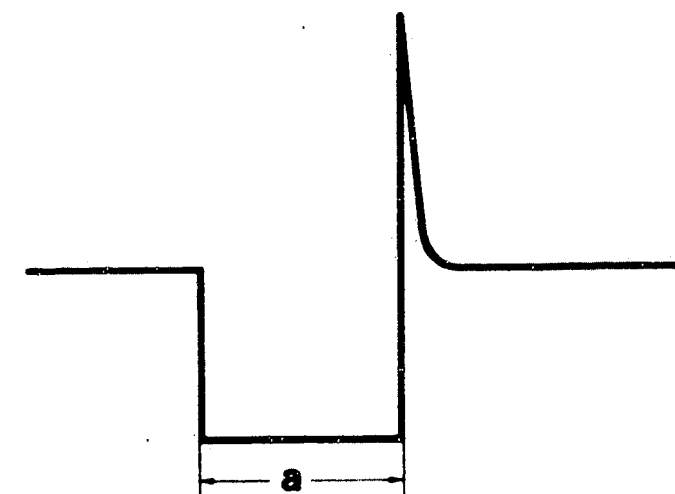
In the case of missing, check all electrical plug-in connections. Pay particular attention to positive supply, ground connection and ignition signal term. 1



- 1 = Connector
- 2 = Test lead 1 684 463 093
- 3 = Free connection
- 4 = Red clamp
- 5 = Black clamp
- 6 = Motortester
- 7 = Injection valve

Injection pulses of a switched output stage (measured at the injection valve)

a = Pulse length (dependent on engine load)



Continued on next picture page

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (8) CONTINUED (1)

After testing is finished:

Ignition "OFF". Disconnect
motortester. Disconnect
test lead from solenoid-
operated injection valve and
connect connector.

With engine off, remove plug
from alternator.
Start engine.
If missing stops, check
alternator and regulator.
Voltage peaks are visisble
on the ignition oscilloscope.

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (9)

Test start control.

Detach ignition cable term. 4 from ignition distributor cap and connect to ground with 5k Ω sleeve-type suppressor 0 356 500 001. Engine must not start.

Connect 2-pole test lead 1 684 463 093 between a solenoid-operated injection valve and its connector. Connect multimeter (preferably analog version) to free measurement terminals. Measuring range approx. 10 V. Detach connector of temperature sensor (engine) and connect 10 k Ω resistor e.g. temperature sensor 0 280 130 028 (at 15°C...30°C 10 k Ω).

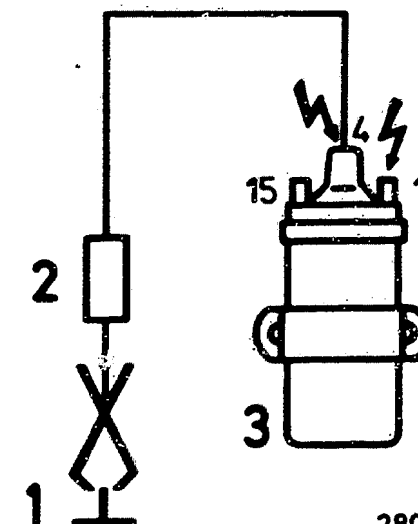
MEASUREMENT:

Start engine.
Set value: Voltage decreases from initially greater than 1,5 V within approx. 15 s starting time to approx. 0,3 V.
Start repetition time longer than 1 minute.

Is set value attained?

N>

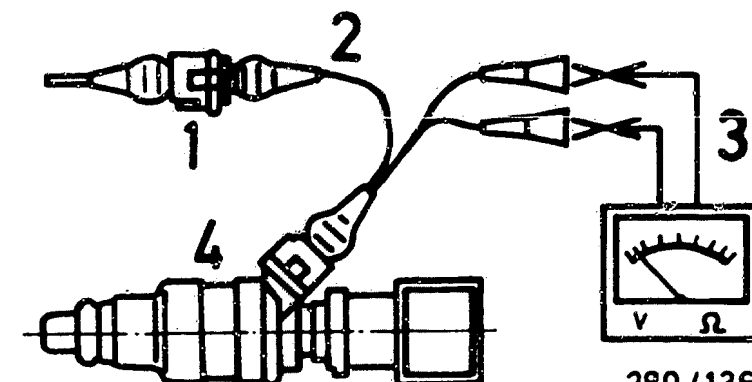
If voltage values not obtained
=> replace control unit.



280/1534

- 1 = Ground terminal
- 2 = Sleeve-type suppressor 5 k Ω 0 356 500 001
- 3 = Ignition coil
- Caution! term. 1 and term. 4:
hazardous voltages
400 V - 25 kV.

- 1 = Connector from vehicle wiring harness
- 2 = Test lead 1 684 463 093
- 3 = Multimeter
- 4 = Injection valve



280/1364

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (10)

Check overrun cutoff

Connect the two-pole test lead 1 684 463 093 between a solenoid-operated injection valve and its connector.
Connect motortester (special input) to test lead. Black clamp to vehicle ground.
Connect red clamp to one of the two connections of the test lead.

Caution: the free connection of the test lead must not come into contact with ground.

Let engine run.

If correctly connected, injection pulses will be visible on the oscilloscope (diagram opposite).

Set value: injection pulses

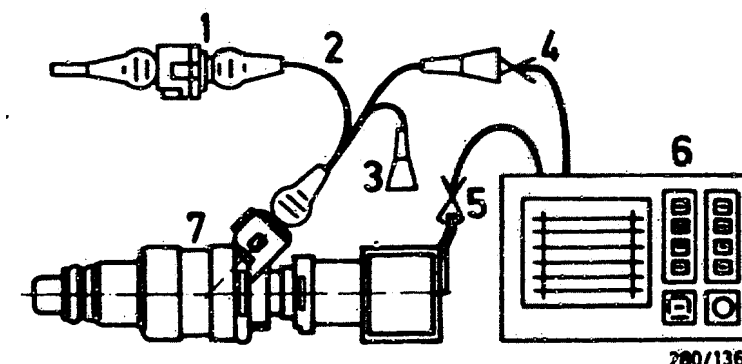
Set value obtained?

N>

Check connections.

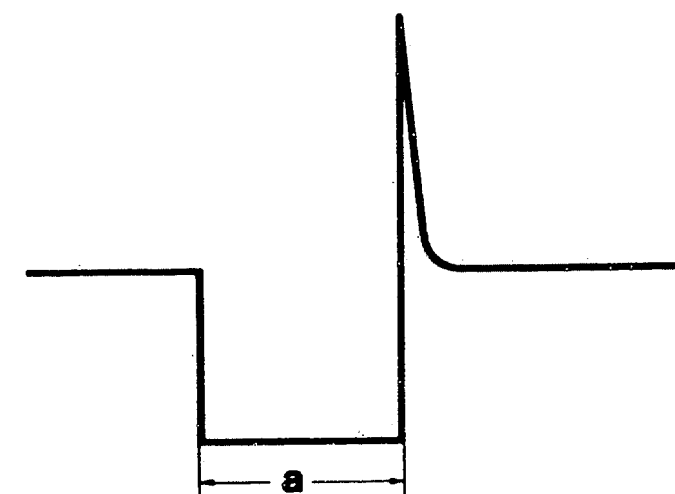
Connect the red clamp from the motortester to the other connection of the test lead.

The free connection must not come into contact with ground.



- 1 = Connector
- 2 = Test lead 1 684 463 093
- 3 = Free connection
- 4 = Red clamp
- 5 = Black clamp
- 6 = Motortester
- 7 = Injection valve

Injection pulses of a switched output stage (measured at the injection valve)
a = Pulse length (dependent on engine load)



Continued on next picture page

280/0249

TROUBLE-SHOOTING PROGRAM (10) CONTINUED (1)

Slowly increase engine speed to approx. 3000 min ⁻¹ .
Injection pulses must be visible on oscilloscope.
Take foot off accelerator pedal (idle position).
Injection pulses no longer present.

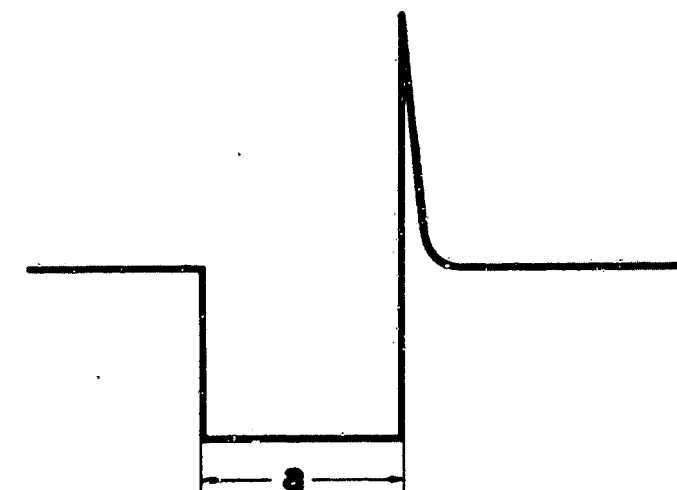
Set value:
With decreasing engine speed, injection pulses cut in again above idle speed.

Is set value attained?

N>

Make sure that the idle switch has been correctly adjusted and is in proper working order.

If this is the case => replace control unit.



280/0249

Injection pulses of a switched output stage (measured at the injection valve)
a = Pulse length (dependent on engine load)

After testing is finished:

Ignition "OFF". Disconnect motortester. Disconnect test lead from solenoid-operated injection valve and connect connector.

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (11)

Check idle speed

Requirement:

- *Air-intake system leak-tight.
- *Air filter not clogged.
- *Auxiliary-air device leak-tight
- *Throttle lever resting on stop.
- *Throttle cable/linkage adjusted free of tension.

*Ignition and valve gear O.K.

Conditions:

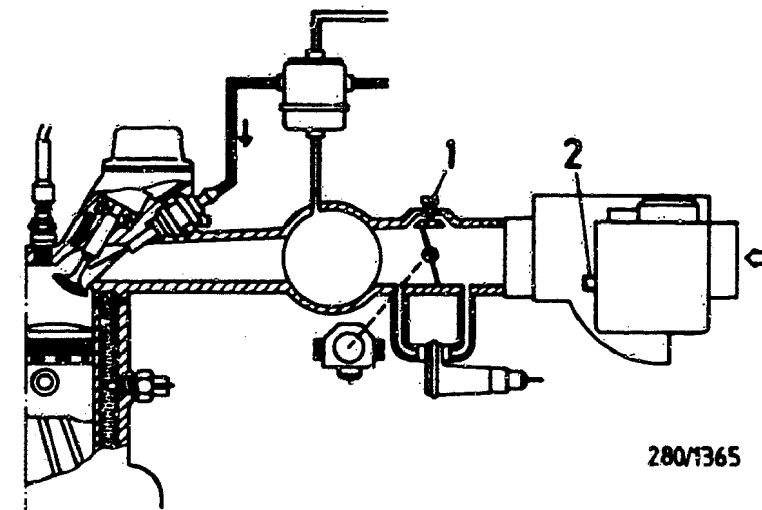
- *Engine at operating temperature, approx. +80°C
- *Air conditioner off.

Set value: see brief instructions

Set value obtained?

N>

Adjust idle speed at bypass screw on throttle-valve assembly.



1 = Idle-speed bypass screw

2 = CO adjusting screw

Test CO content

The L3.2-Jetronic makes use of lambda closed-loop control. The integrator voltage is measured instead of the CO content.

Refer to next micro-picture in the event of idle problems.

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (12)

Test lambda sensor

The L3.2-Jetronic employs lambda closed-loop control. The integrator voltage is measured instead of the CO content.

Connect multimeter:
(preferably analog version)

- * Positive to measurement output, lambda closed-loop control, control unit term. 10. Refer to brief instructions for installation location.
- * Negative to engine ground.
- * Measuring range approx. 15 V.

Conditions:

- * Engine at operating temperature approx. +80°C
- * No leaks in exhaust system.
- * Short-circuit idle and full-load switches to vehicle ground.

Set value: Uniformly fluctuating reading between 0...13 V.

Is set value attained?

N>

Trouble-shooting:

Use ohmmeter to test following leads for continuity approx. 0 Ω ,

- * From heater plug to pump relay term. 87.
 - * From heater plug to vehicle ground.
 - * From sensor housing to vehicle ground.
- Detach control-unit plug.
From sensor plug to control-unit plug term. 13.

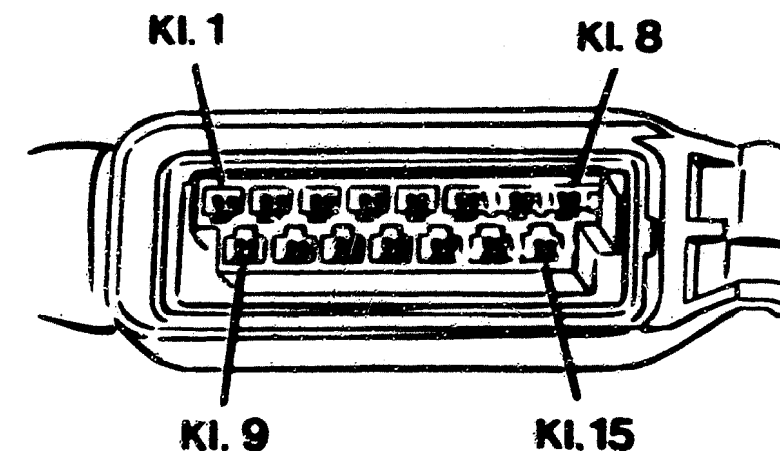
Test shield term. 5 to sensor lead term. 13,
resistance at least 1 M Ω .
Attach control-unit plug.

Run engine at operating temperature
If set value is now attained \rightarrow continue with next micro-picture.

If reading is 8...15 V \rightarrow
test sensor heater,
internal resistance: 1...15 Ω .

Use digital multimeter
(R1 greater than 1 M Ω) to measure sensor signal with respect to ground.
Sensor voltage: 0.05...1.0 V.
If a value is not attained
 \rightarrow renew lambda sensor.

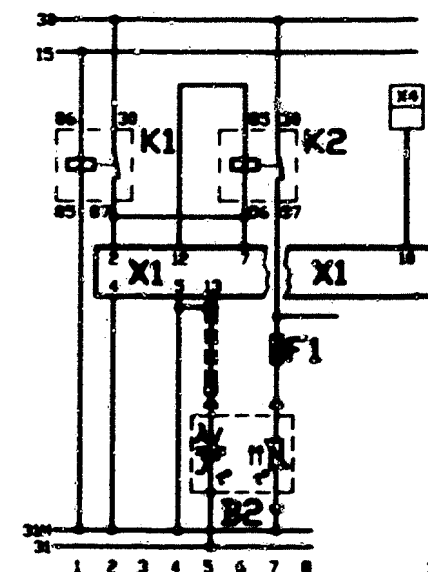
Only coat sensor thread with a small amount of grease Vs 140 16 Ft.



227 / 354

Top view of control-unit plug

B2 = Heated lambda sensor
K1 = Main relay
K2 = Pump relay
X1 = Control-unit plug
X4 = Test output for lambda closed-loop control (Diagnosis output)



S2001531

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (12) CONTINUED (1)

Test lambda closed-loop control
(control-unit functions)

Conditions:

- *Engine at operating temperature approx. +80°C
- *Short-circuit idle and full-load switches to vehicle ground.

Disconnect lambda-sensor plug.

Simulation of lean mixture:
Connect signal lead on control-unit end to ground.
There must be an increase in integrator voltage.
Set value: 10...13 V.

Simulation of rich mixture:
Apply 1.5...2.0 V to lead on control-unit end.
There must be a drop in int. volt.
Set value: less than approx. 0.5 V.

Is set value attained?

N>

Check following lead for continuity with ohmmeter, set value approx. 0 Ω :
From control-unit plug term.13 to sensor plug.

Check following lead for insulation with ohmmeter, set value greater than 1 M Ω :
From control-unit plug term.13 to vehicle ground.

If set value is not obtained, replace control unit.

Integrator-voltage test

Connect up lambda-sensor plug.

Set value: Uniformly fluctuating reading between 0...13 V.

Is set value attained?

N>

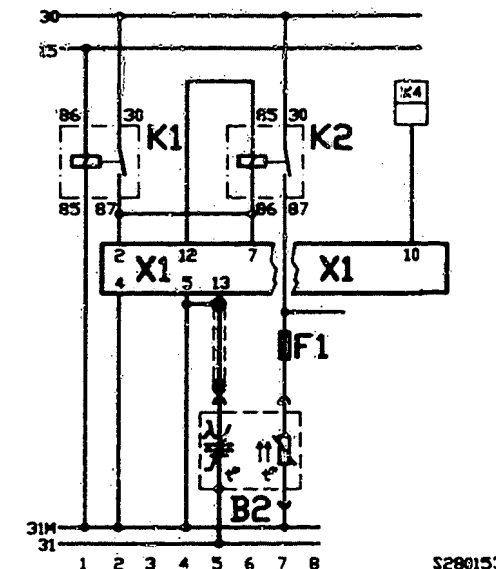
Adjustment:

Lever out large securing cap (on side of control unit).

Turn CO adjusting screw until reading fluctuates uniformly between 0...13 V.

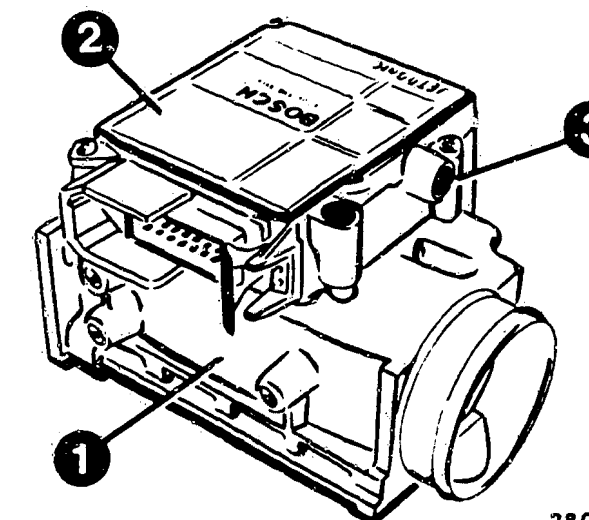
Press in new securing cap.

Return to trouble-shooting chart B03



B2 = Heated lambda sensor
K1 = Main relay
K2 = Pump relay
X1 = Control-unit plug
X4 = Test output for lambda closed-loop control (Diagnosis output)

1 = Air-flow sensor
2 = Control unit
3 = Anti-tamper cap for CO adjusting screw



280 / 1366

TROUBLE-SHOOTING PROGRAM (14)

V

Test exhaust-gas catalytic converter.

N>

Conditions:

*Lambda closed-loop control must be in proper working order.

*There must be an exhaust-gas sampling point upstream of the catalytic converter.

If not, unscrew lambda sensor and screw in adapter (self-produced with M 18x1.5 thread).

*Engine at operating temperature, approx. 80°C.

*Disconnect lambda-sensor plug (open-loop control).

Measure CO contents upstream and downstream of catalytic converter. Front sampling point must be sealed off when taking measurement downstream of catalytic converter. Note down both values.

Set value: CO content downstream of catalytic converter must be clearly lower than ahead of it.

Is set value attained?

Y

V

Remove adapter and screw in lambda sensor.

Connect up sensor plug (closed-loop control).

Y

V

Return to trouble-shooting chart B03

V

If the two CO values are virtually identical, the catalytic converter is clogged and having no effect (e.g. due to leaded fuel).

Renew catalytic converter.

TROUBLE-SHOOTING PROGRAM (15)

Check tank-ventilation system.

Check visually whether hoses of tank-ventilation system are correctly attached, not bent or damaged.
Check whether hose connections at intake manifold, tank bleeder valve, active-carbon canister and fuel tank are leak-tight.

Are all hoses and connections O.K.?

Replace defective hoses as necessary.
Eliminate leakages by tightening hose clamps.

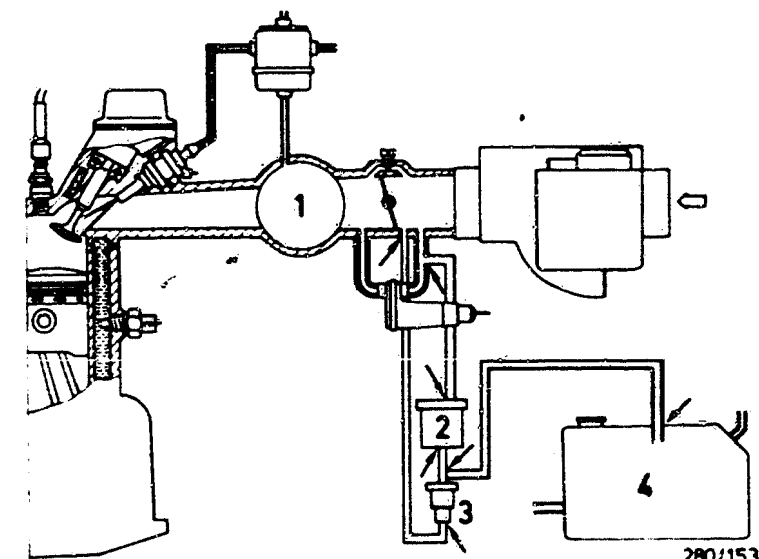
The tank ventilation valve operates without electrical actuation. It is opened by the intake-manifold pressure when the throttle valve is open (particularly in part-load range). The active-carbon container is thus flushed with fresh air.

The tank ventilation valve must be free from leaks in the idle range.

Are all functions of the tank ventilation valve O.K.?

Renew defective intake-manifold-pressure actuator or defective tank ventilation valve.

Return to trouble-shooting chart B03



1 = Intake manifold
2 = Active-carbon container
3 = Tank ventilation valve
4 = Fuel tank

Arrows = possible leakage points

INDEX

Term	Coordinate
Adapter lead	A09
Air intake system	C19
Air-flow sensor, electrical	B27, C25
Air-flow sensor, mechanical	C23
Air-flow signal (Up output)	B27
Air-line diagram	A21
Altitude sensor	C01
Auxiliary-air device	B23, C21
CO content	D25
Control unit	A19
Electric fuel pump	D01
Engine missing	D15
Engine-speed signals	B15
Exhaust-gas catalytic converter	E03
Fuel delivery	D01
Fuel filter	D01
Fuel leakage	D05
Fuel pressure	D03
Fuel-injection pulse	C03
Fuel-line diagram	A21
Full-load contact	B13
Full-load enrichment	C15
Ground connection	B07
How to use microcard	A01
How to use trouble-shooting chart	B01
How to use trouble-shooting program	B02
How to use universal test adapter	B04
Idle contact	B11
Idle speed	D25
Ignition signal	B15
Installation position of components	A13
Intake-manifold-pressure actuator	D05
Integrator voltage	D27
Interference	D15
Interference suppression	D15

Index, continued

Term	Coordinate
Lambda closed-loop control	E01
Lambda sensor	C05, D27
Leak test	C19
Main relay	B17
Measurement and control facility	A19
Measurement output - lambda closed-loop control	C17
Overrun cutoff	C13, D21
Pre-supply pump	D01
Precautionary measures	A05
Pressure damper	D05
Pressure regulator	D03
Pressure sensor (altitude sensor)	C01
Pump noise	D11
Pump relay	B19
Reference voltage (UV output)	C07
Safety measures	A05
Sensor monitoring	C05
Solenoid-operated injection valve	A13, D07, D13
Special features	A03
Start control	D19
T y encoding of lambda closed-loop control	B09
Tank ventilation system /valve	E05
Temperature sensor (engine)	B05
Temperature sensor (intake air)	C25
Test chart for universal test adapter	B03
Test prerequisites	B01
Testers	A07
Throttle-valve adjustment	B11
Throttle-valve switch	B11
Tools	A07
Trouble-shooting chart	B03
Trouble-shooting program	C19
Universal test adapter	A09
Voltage supply	B17